# Railway Shop Kinks

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Compiled under the direction of a committee of the International Railway General Foremen's Association.

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By ROY V. WRIGHT

Mechanical Department Editor, Railway Age Gazette.

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*Under the supervision of the following committee:*

H. D. Kelley, Chairman, General Foreman, Chicago & North Western Railway, Chicago,

C. H. Voges, General Foreman, Cleveland, Cincinnati, Chicago & St. Louis, Bellefontaine, Ohio.

L. H. Bryan, General Foreman, Duluth & Iron Range, Two Harbors, Minn.



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1911

RAILWAY AGE GAZETTE

NEW YORK: 83 Fulton Street.
CHICAGO: Plymouth Building.
CLEVELAND: New England Building.
LONDON: Queen Anne's Chambers.

Resolution adopted by the Executive Committee of the International Railway General Foremen's Association at a meeting held in Chicago, December 12, 1910:

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"WHEREAS, The Railway Age Gazette has collected a considerable amount of valuable data on shop kinks that is available for reproduction in book form; and

"WHEREAS, The Shop Kinks Committee believes that its work and the interests of the Association would best be advanced by co-operating with the Railway Age Gazette in the publication of such a book, in which shall be embodied the work of that committee; be it

"RESOLVED, That the Railway Age Gazette be and hereby is authorized and empowered to publish, under the supervision of the Chairman of the Committee on Shop Kinks of this Association, an illustrated book of shop kinks."

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# PREFACE

At the sixth annual convention of the International Railway General Foremen's Association at Cincinnati, Ohio, May, 1910, the suggestion was made that the work of the association would be more effective if the subjects which were selected for discussion were fewer in number and of a more practical nature. In accordance with this suggestion, the Executive Committee selected four subjects for discussion at the 1911 convention. One of these was shop kinks and was assigned to H. D. Kelley, general foreman, Chicago & North Western, Chicago. After thoroughly canvassing the situation, Mr. Kelley came to the conclusion that a study of this subject, prepared in a proper manner, would cost far more to reproduce than the association could well afford.

In October, 1909, the *Railway Age Gazette* inaugurated a Shop Section as part of the first issue of each month. An important feature of the Shop Section has been the results of a number of shop kink competitions which have been held, and which have drawn out and resulted in the publication of several hundred shop kinks used in connection with the repair and maintenance of cars and locomotives and other equipment in the care of the mechanical department. Five general shop kink competitions of this sort have been held, prizes being awarded as follows:

September 15, 1909: First prize, D. P. Kellogg, master mechanic, Southern Pacific, Los Angeles, Cal.; second prize, C. J. Drury, general roundhouse foreman, Atchison, Topeka & Santa Fe, Albuquerque, N. Mex.

December 15, 1909: First prize, F. C. Pickard, assistant master mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.; second prize, W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.

February 15, 1910: First prize, Elmo N. Owen, general foreman, Southern Pacific, Bakersfield, Cal.; second prize, William G. Reyer, general foreman, and J. W. Hooten, foreman of repairs, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

June 15, 1910: First prize, C. J. Crowley, piece work inspector, Chicago, Burlington & Quincy, West Burlington, Iowa; second prize, E. G. Gross, master mechanic, Central of Georgia, Columbus, Ga.

January 15, 1911: First prize, M. H. Westbrook, Grand Trunk, Battle Creek, Mich.; second prize, R. G. Bennett, motive power inspector, Pennsylvania Railroad, Pittsburgh, Pa.

In addition to these general shop kink competitions, engine house kink competitions were held September 15, 1910, and March 15, 1911, with the following results:

September 15, 1910: First prize, Richard Beeson, roundhouse foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.; second prize, C. J. Lindgren, roundhouse foreman, Chicago, Burlington & Quincy, Aurora, Ill.

March 15, 1911: First prize, C. C. Leech, foreman, Pennsylvania Railroad, Buffalo, N. Y.; second prize, H. L. Burrhus, assistant to general foreman, Erie Railroad, Susquehanna, Pa.

A car department kink competition was held November 15, 1910, the first prize being awarded to W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa., and the second prize to C. C. Leech, foreman, Pennsylvania Railroad, Buffalo, N. Y.

In addition to these kink competitions, several competitions of a more general nature were held as follows:

April 15, 1910—How the Foreman Can Promote Shop Efficiency: First prize, William G. Reyer, general foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.; second prize, George H. Roberts, assistant machine foreman, New York, New Haven & Hartford, Readville, Mass.

October 15, 1910—Care and Selection of Machine Tools and Shop Equipment: First prize, J. S. Sheafe, engineer of tests, Illinois Central, Chicago, Ill.; second prize, E. T. Spidy, instruction card inspector, Canadian Pacific, Angus Shops, Montreal, Can.

December 15, 1910—Increasing Shop Output: First prize, H. L. Burrhus, assistant to general foreman, Erie Railroad, Susquehanna, Pa.; second prize, William G. Reyer, general foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

February 15, 1911—Car Department Competition: First prize, Robert G. Bennett, motive power inspector, Pennsylvania Railroad, South Pittsburgh Shops, Pittsburgh, Pa.; second prize, A. G. Pancost, draftsman, Elkhart, Ind.

April 15, 1911—Instruction of Workmen and Apprentices: First prize, H. S. Rauch, apprentice instructor, New York Central & Hudson River, Oswego, N. Y.; second prize, John H. Linn, apprentice instructor, Atchison, Topeka & Santa Fe, Topeka, Kan.

Realizing that the *Railway Age Gazette* thus had a large amount of valuable data on shop kinks in its files, which were available for reproduction, Mr. Kelley asked the Executive Committee of the International Railway General Foremen's Association to authorize the publication of a Railway Shop Kink book under the auspices of that association and prior to the 1911 convention.

The kinks in this book have, therefore, been selected from shop kinks published in the Shop Section of the *Railway Age Gazette* and include not only the results of the above-mentioned competitions, but also special contributions, and investigations made by its editors.

The descriptions of the kinks have been carefully revised and in many cases amplified, and the kinks have been classified as far as possible according to the different shops or departments in which they are used. The classification in some cases has had to be made on a more or less arbitrary basis. For instance, most of the kinks which are used in the engine house may be used to advantage in the erecting shop, particularly when we remember that the engine houses throughout the country vary from houses with a few stalls to those with from 40 to 55 or more stalls. Some of the engine houses are often located at a great distance from the main shops, while others are adjacent to them. In some cases an engine house may have shops in connection with it of greater importance than the entire shop plant of one of the smaller roads or at a division point on a large road. In referring to the different departments, therefore, it is quite likely that other kinks which may be used to advantage in that department will be found in other chapters. With this in mind, a very complete index has been provided.

New York, June 30, 1911.

# CONTENTS

# Machine Shop Kinks

## BELT CLAMP AND STRETCHER.

An efficient belt clamp and stretcher is illustrated in Fig. 1. The device consists of two clamps, 12½ in. long, made of 2-in. angle iron. The clamps may be opened and closed quickly by the handle nuts. Two parallel iron strips with teeth cut in the outer edges are riveted to one member of the clamp. The other member is riveted to a piece which slides between the two longitudinal members. This slide also carries an operating lever and two dogs. When the lever is operated back and forth the clamp is advanced and the belt stretched a corresponding amount. With one of these clamps a man can take care of all belts of 6-in. width and under. The operation of stretching is performed quickly and the expense of belt maintenance will be largely reduced by introducing such a device into the shop.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

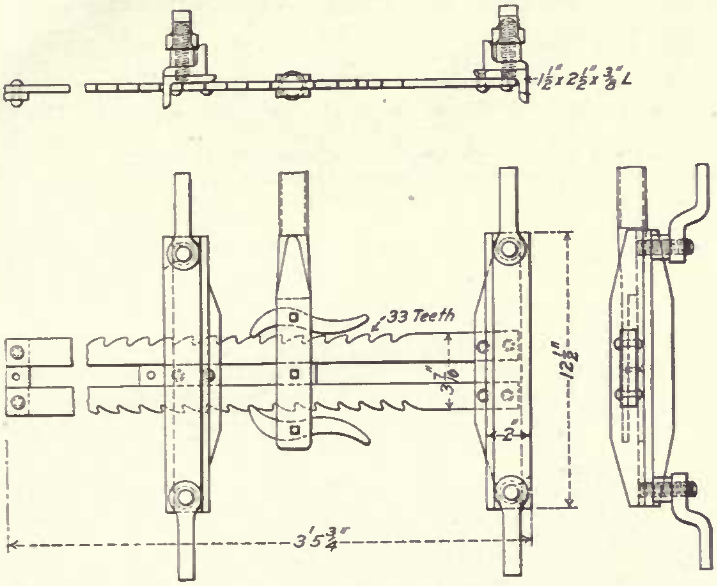



Fig. 1—Belt Clamp and Stretcher.

## BELT LACING.

There seems to be no standard method for lacing belts. In most shops every man has his own way and some belts get improper treatment; this is especially true of those running on cone pulleys. The method of shifting a belt from one step of a cone to another is important. If the proper care is not exercised a belt can soon be stretched out of shape on one side and will have a tendency to creep on the next step of the cone. In lacing the belt both ends should be cut square and be drawn tight against each other. When shifting a belt from one step of a cone to another care should be taken not to drag it from the smallest to the largest step, but to get it on the next larger step. Then, with very little effort, it can be put where it is wanted and not be stretched out of shape. Do not put any resin or any kind of belt dressing on it that will hang or stick on the side of the cone, as this is very destructive to a belt. As soon as a belt starts to creep on the side of the cone it should be turned end-for-end, or the outside be turned to the pulley. Doing this will often save a belt from destruction. The number of holes and width of laces to be used for lacing belts is shown on the accompanying table and in Fig. 2. This style of lacing is giving good satisfaction. Punch the holes as shown on the sketch and table, according to the width of the belt. Commence lacing from the outside, bringing one end of the lacer through *A* and the other end through *B*, crossing them on the inside of the belt. Put them back down *A* and *B* again, coming up through *C* and *D* and crossing on the inside as before, and then going back down *C* and *D* and coming up through *E* and *F*, and so on. In finishing, either tie, or if there is any lacer left, finish by going back, as shown by dotted lines on the sketch. When finished, take a hammer and

*Table for Lacing Belts.*

| Width of Belt. | Width of Lacer. | No. holes in First row. | No. holes in Second row. | Distance of holes At X. | Distance of holes At Y & Z. |
|---|---|---|---|---|---|
| 2-in. | ¼-in. | 2 | 1 | ½-in. | ½-in. |
| 2½-in. | ¼-in. | 3 | 2 | ½-in. | ½-in. |
| 3-in. | 5/16-in. | 3 | 2 | ½-in. | ½-in. |
| 3½-in. | ⅜-in. | 3 | 2 | ½-in. | ½-in. |
| 4-in. | ⅜-in. | 4 | 3 | ½-in. | ½-in. |
| 4½-in. | 7/16-in. | 4 | 3 | ½-in. | ½-in. |
| 5-in. | 7/16-in. | 5 | 4 | ½-in. | ⅝-in. |
| 5½-in. | 7/16-in. | 5 | 4 | ½-in. | ⅝-in. |
| 6-in. | ½-in. | 5 | 4 | ⅝-in. | ¾-in. |
| 6½-in. | ½-in. | 6 | 5 | ⅝-in. | ¾-in. |
| 7-in. | ½-in. | 6 | 5 | ⅝-in. | ¾-in. |
| 7½-in. | ½-in. | 7 | 6 | ⅝-in. | ¾-in. |
| 8-in. | 9/16-in. | 7 | 6 | ⅝-in. | ¾-in. |
| 8½-in. | 9/16-in. | 7 | 6 | ¾-in. | ⅞-in. |
| 9-in. | 9/16-in. | 7 | 6 | ¾-in. | ⅞-in. |
| 9½-in. | 9/16-in. | 8 | 7 | ¾-in. | ⅞-in. |
| 10-in. | ⅝-in. | 8 | 7 | ¾-in. | 1-in. |
| 10½-in. | ⅝-in. | 8 | 7 | ¾-in. | 1-in. |
| 11-in. | ⅝-in. | 8 | 7 | ¾-in. | 1-in. |
| 11½-in. | ⅝-in. | 9 | 8 | ¾-in. | 1-in. |
| 12-in. | ⅝-in. | 9 | 8 | ¾-in. | 1-in. |

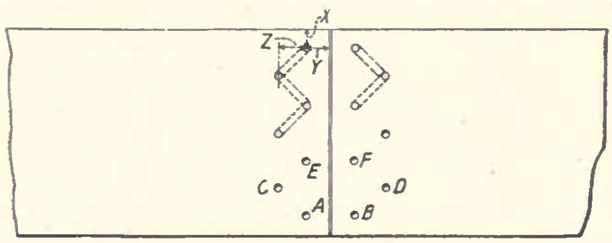


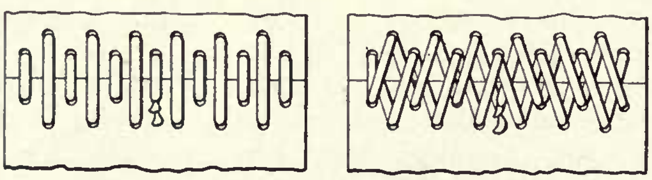

Fig. 2—Diagram for Lacing Belts.

flatten the lacer down. The feature of this lace is that where the lacer crosses on the inside the edges are somewhat higher than the rest of the lace, which has a tendency to make it wear longer.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

### BELTING, CARE AND MAINTENANCE OF.

*Poor Belt Maintenance and Its Effect on Output.*—If a machine stands idle during working hours, while the belt is being repaired or tightened, it produces nothing during that time, and there is a distinct loss in output. If it stands idle for one-half hour in ten hours' working time there is a loss of 5 per cent. in its output; if in a shop having 100 machines ten machines lose one-half hour each day on account of repairs to belts it amounts to a loss of 0.5 per cent. of the total output of the shop. This, however, is probably not so serious as the loss in output due to belts being run so loose that they cannot begin to take the speeds, feeds and depth of cut for which the machines were designed and that the tools will stand. Almost every efficiency engineer in attempting to bring up the speeds of his machines to what he knows is possible has found that such attempts usually result in the belts slipping and breaking, or the lacings giving out, and he knows that where the care of belts is left to the man at the machine, in only a very few cases can the belts be depended on to do the maximum amount of work. Belts of the best quality must be used at proper tension, and they must be kept in first-class condition and be inspected out of working hours. Very few machinists, or even foremen, know how to tighten or lace a belt properly, the amount to to be taken out being usually guessed at, and much time is lost through the machines standing idle while the cutting and trying is going on. I have known cases where good machinists have run cone belts, which have been made too tight, on "cross cones," i. e., on steps not in line with each other, the result being that the belt twisted itself up like a corkscrew and was practically ruined.

*Proper Method of Lacing.*—It is safe to cut belts 2 in. short in every ten feet of measured length. To lace with leather lacings, butt the ends of the belt together, being careful that the edges are cut exactly at right



PULLEY SIDE. OPPOSITE SIDE.

**Fig. 3—Correct Method of Lacing a Belt.**

angles to the belt. Holes should then be cut in the belt with an oval punch, making the larger diameter of the oval parallel with the sides of the belt. The holes should be punched as nearly as possible according to the following table:

| Width of belt. | Punching lace holes, from ends of belt, First row. | Second row. | Centers of outer holes on row near ends of belt, to be distant from each edge of belt. | Size of lace leather to be used. |
|---|---|---|---|---|
| 2 to 4 in.... | 3/8-in. | 3/4-in. | 3/8-in. | 3/16-in. |
| 6 " 8 in.... | 1/2-in. | 1 in. | 1/2-in. | 1/4-in. |
| 10 " 12 in.... | 5/8-in. | 1 1/4-in. | 5/8-in. | 5/16-in |
| 14 " 16 in.... | 3/4-in. | 1 1/2-in. | 3/4-in. | 3/8-in. |
| 18 " 20 in.... | 7/8-in. | 1 3/4-in. | 7/8-in. | 7/16-in. |
| 22 " 24 in.... | 1 in. | 2 in. | 1 in. | 1/2-in. |

The best method of lacing a belt is shown in Fig. 3; the lacing on the pulley side of the belt runs parallel with the belt and is crossed on the opposite side.

*Belt Tension.*—Belts put on too tight produce excessive strain on the pulley bearing and consequent loss of power and output. Belt clamps, Fig. 4, having spring

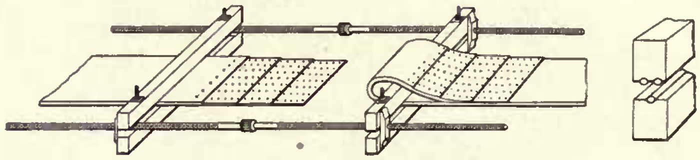


**Fig. 4—Belt Clamp.**

balances between the pair of clamps, should be used for measuring the tension accurately each time the belt is tightened. They should be tightened in this manner to give the following pressure per inch of width, with an arc of contact of 180 degrees:

| | | |
|---|---|---|
| 3-ply about 47 lbs. | 5-ply about 63 lbs. | 7-ply about 80 lbs. |
| 4-ply about 57 lbs. | 6-ply about 70 lbs. | 8-ply about 95 lbs. |
| | 10-ply about 140 lbs. | |

Clamps for tightening belts, as shown in Fig. 4, can easily be made in various sizes to suit the different belts.

*Cemented Splices.*—Cemented splices, when properly made, give the best results and are being adopted by

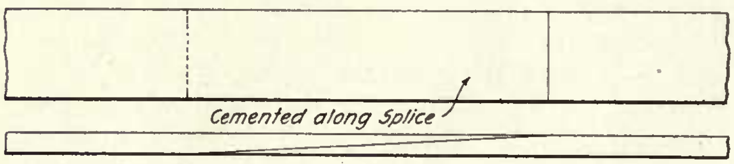



**Fig. 5—Proper Method of Cementing a Belt; Cemented Splices Are Being Adopted Extensively.**

most up-to-date machine shops. The ends of the belts are beveled and then firmly cemented and rolled or pounded together and allowed to dry thoroughly before being run on the pulleys.

*Keep Belts Clean.*—One of the most important points in the care of belts is to keep them clean. All belts should be examined frequently, and the greasy or dirty ones scraped to remove all surface dirt. They should then be washed with warm water and soap, care being taken that the water is not too hot to be uncomfortable to the hands. Very dirty or greasy belts can be cleaned with a mixture of two parts of gasoline and one part of turpentine, but remember that this mixture is highly inflammable and must be kept away from open lights and fires; then scrape the loosened dirt off with an old file or dull knife, and wash again if you have not reached bare, clean leather. When the belt is dry it should be given a light, even coating of castor oil on the working side, and if very dry, on both sides.

*A Good Belt Dressing.*—A good formula for a surface compound for belts is: Equal parts of red lead, black lead, French yellow and litharge. Mix with boiled linseed oil and add enough japan to make it dry quickly. A thin coating can be applied with a brush and should be allowed to dry before running the belt. There are several good preservative foods or dressings manufactured by reliable firms which may be applied to belts after cleaning and from which splendid results have been obtained, as shown by experiments, records and data kept before and after treatment.

*Belt Shifters.*—A shifter having rollers should be used when the belt is a wide one. These rollers should press against the flat of the belt, not the sides, thus

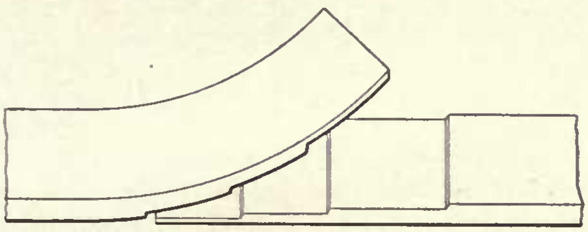


**Fig. 6—Best Method of Cutting a Lap Splice for a Composition Belt.**

avoiding heating and damaging the edge of the belt. Near each pulley on the lineshaft, where a belt drives a machine that is liable to stand idle for some time, a staple should be driven into the rafters or ceiling. A hook of ⅜-in. round iron should be hung from the staple; it should be made long enough to reach almost to the rim of the pulley, but a little to one side of it. When a belt is taken off its pulley it should be hooked up by the belt stick, the slack of the belt allowing it to be caught on the hook. When the belt sags the hook

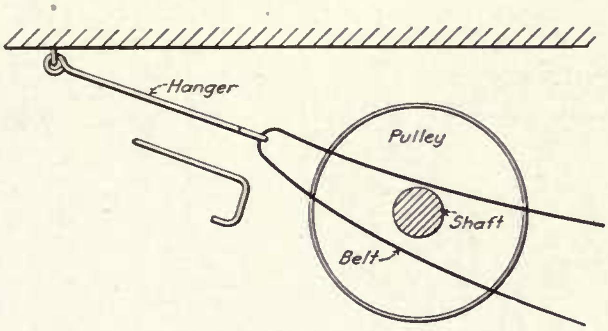



**Fig. 7—Arrangement for Hanging Idle Belt to Clear Pulley and Line Shaft.**

should swing so as to make the belt clear the side of the pulley and also the shaft, as shown in Fig. 7. This avoids the tieing of belts to beams, hangers, etc., or of leaving them hanging on the revolving shaft, causing the belt to be worn through or weakened. It is very little trouble to hook them up.

*Keeping Track of the Belt Repairmen.*—In large machine shops and factories where a great number of belts are used a recording board, as shown in Fig. 8, has been used to advantage for keeping track of the belt man and keeping him informed as to the department or section of the works in which his services are required. Each of the top holes in the board has a number corresponding to a department or section. Near the center of the board is a row of holes having black pegs inserted in them, and at the bottom of the board are two more rows of holes, in which red pegs are inserted. These

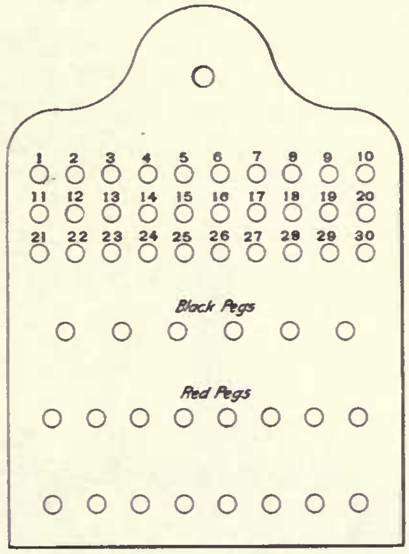



**Fig. 8—Recording Board for Belt Repairman.**

lower holes are numbered from 1 to 15. When the belt man is wanted one of the numbered red pegs is put in the hole at the top to show the department where a belt requires attention. When the belt man returns he sees at a glance where he is wanted. Before he leaves the board he replaces the red peg with a black one. The first party coming to the board uses red peg No. 1, the second No. 2, and so on, thus letting the belt man know where to go first.

*Belt Guards.*—All belt drives within reach of persons standing on the floor, or on adjacent platforms, such as drives to emery wheels, etc., should be carefully guarded by wire screens of not less than 1-in. mesh. These are light and can be easily removed when it is necessary to get at the belt.

*General Suggestions.*—In conclusion, let me offer a few suggestions.

*1.* The best belt speed is from 4,000 to 4,500 ft. per minute.

*2.* To find the velocity of a belt, multiply the diameter in feet of the pulley by the number of revolutions of the pulley by 3.1416; this gives the velocity in feet per minute.

*3.* Never overstrain a belt, as this produces unnecessary wear of belts and machinery and causes considerable loss of power by friction.

*4.* Do not throw on belts when pulleys are running at an extremely high rate of speed.

*5.* Do not run belts exceedingly tight, as the best service and greatest power are derived by their being just slack enough not to slip.

*6.* A steel tape is best in taking measurements for belting; other methods are less reliable.

*7.* A light belt on a large pulley is preferable to a thick belt on a small pulley.

*8.* The better you look after your belts the fewer machine failures you will have, which means less worry and more money.—*A. D. Porter, Shop Efficiency Inspector, Canadian Pacific, West Toronto, Ontario, Can.*

### BOLT-CENTERING MACHINE.

A bolt-centering machine used at Elizabethport is shown in Fig. 9. The necessity for this machine arose from the fact that the machine had a long lever feed, which allowed excessive pressure, resulting in broken drills, especially when operated by green apprentices. In

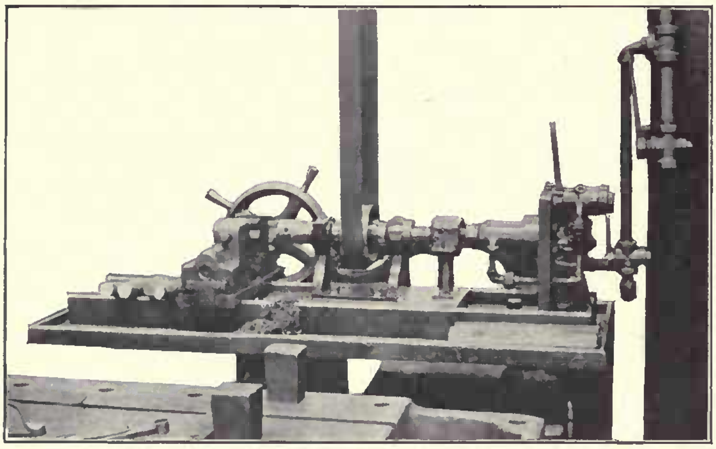


Fig. 9—Bolt-Centering Machine.

the present design the drill is fed into the bolt by air pressure. The three-way valve fastened to the upright plate at the right-hand end of the machine is the same as used in a locomotive cab for controlling the air which operates the water scoop. When the air is admitted it exerts a steady and sufficient pressure against the drill to feed it into the metal. When the drilling is completed the handle is thrown over, releasing the air behind the piston and at the same time admitting air in front of it to withdraw the drill.

The machine is made from scrap material which may be found about any shop.—*Central Railroad of New Jersey, Elizabethport, N. J.*

### BOLT CHUCK OR DRIVER.

A simple driver for a bolt lathe is shown in Fig. 10. These drivers are made in sets for the different sizes of bolts to be turned. Two holes are tapped in the face plate and studs are screwed in to hold the drivers, so that they may be easily and quickly placed or removed. The driver has many points of advantage over the old style driver, as it adjusts itself to the head of the bolt, provides a double drive and keeps the lathe balanced, which is necessary when running at high speeds. The best way in which to make these drivers is to plane a long bar of steel to shape and cut off the drivers to the different widths desired; hardening will increase their life about 300 per cent.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

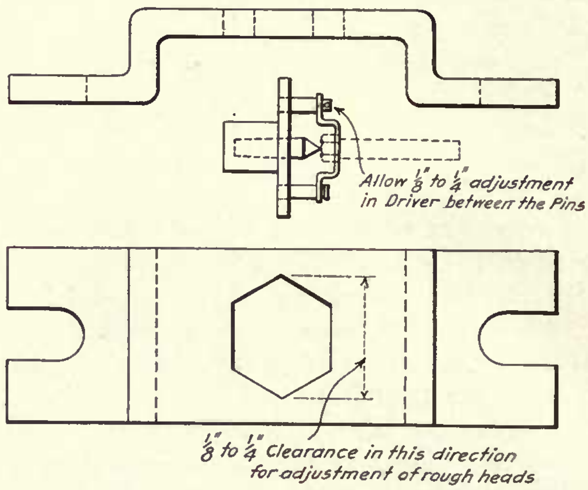



Fig. 10—Bolt Chuck or Driver.

### BOLT CHUCK OR DRIVER.

A chuck for holding the heads of bolts, which is much more convenient than the dogs or drivers that are ordinarily used, is shown in Fig. 11. The two parts of the clamp are each held at one end by a ⅝-in. stud bolt. In order to adjust the distance between them, they swing around these bolts and may be clamped in any desired position by tightening the square head stud bolts at the other end.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic; Henry Holder, General Foreman, and James Findlay, Machine Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

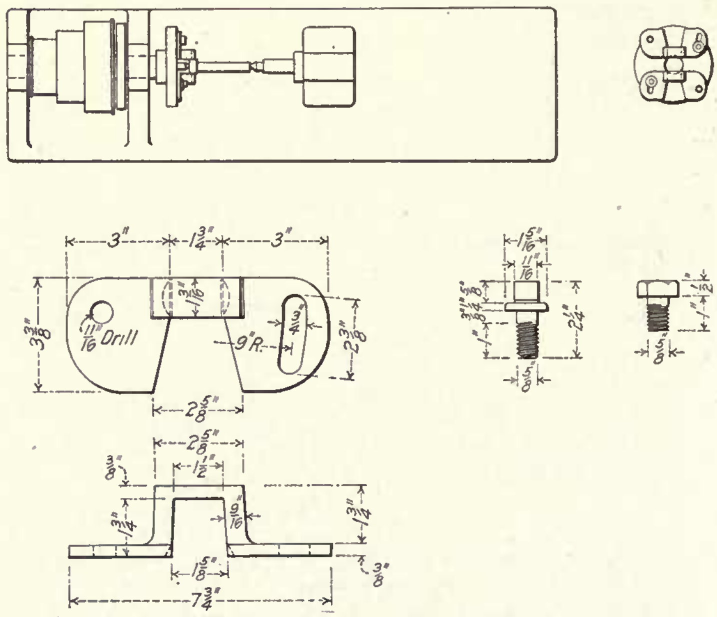



Fig. 11—Adjustable Chuck for Holding Bolt Heads.

### BOLT MACHINE ATTACHMENTS.

Three useful labor-saving attachments for use on a four-spindle Lassiter bolt machine are shown in Fig.

12. The attachment at the left is used for roughing cuts or turning straight bolts. The attachment in the center is used for cutting off taper or straight bolts, and the hollow mill shown in the center is used for sizing bolts for threading. The attachment to the right is used for pointing and turning teats on the ends of bolts. The dies are tripped from the under side by the thumb screw shown and can be adjusted for any length of thread. With these attachments, bolts are handled direct from the heading machine, requiring no centering. The attachments are also adapted for use on a drill press. —*William G. Reyer, General Foreman, and J. W. Hooten, Foreman Repair Work, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

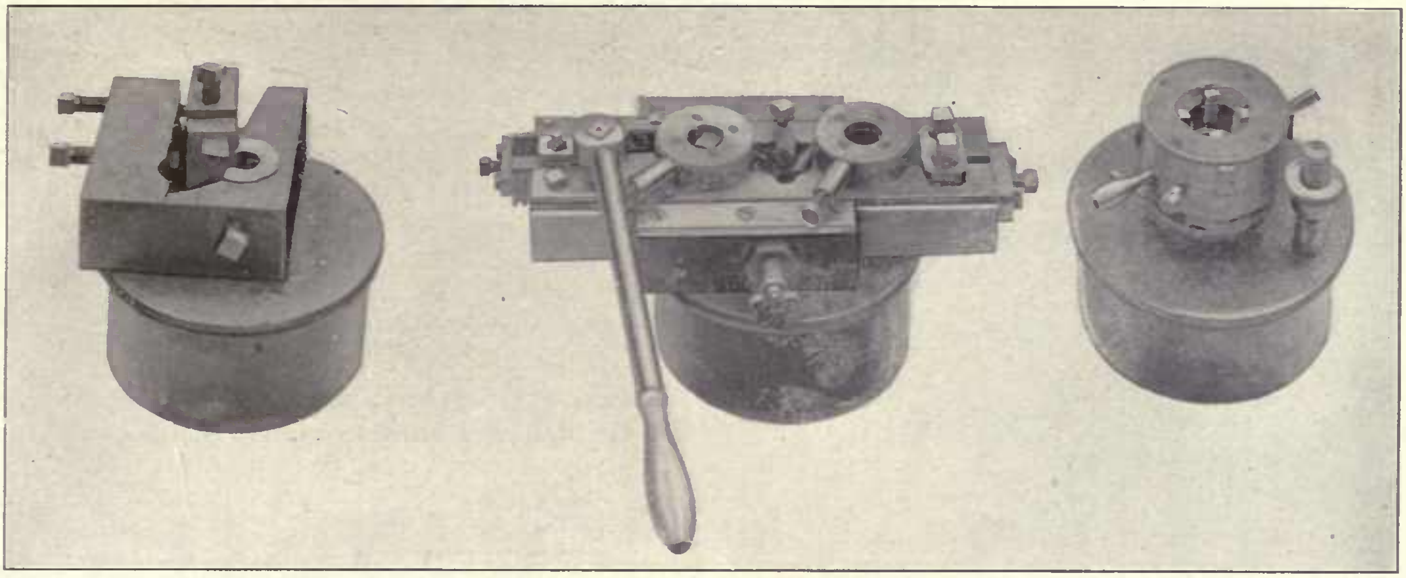


**Fig. 12—Bolt Machine Attachments.**

BOLTS, STANDARD TAPER.

There are two standards of taper bolts in use on Delaware, Lackawanna & Western 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. Regular schedules have been adopted for the making of all sizes and lengths of these bolts, and these are shown in the accompanying tables, Figs. 13 and 14.—*Delaware, Lackawanna & Western, Scranton, Pa.*

| Standard Bolts | | | For Straight Bolts. Straight Roughing | For Straight Bolts. Straight Finishing | For Taper Bolts. Taper Roughing | For Taper Bolts. Taper Finishing | | | Taper Finishing | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Diam. | Length Under Head | Diam. Under Head | Diameter | Diameter | Diameter | Small Diam. | Large Diam. | Handle Diam. | 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 | .890 | 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

**Fig. 13—Plug Gages for Bolt Turning Machine.**

| Standard Bolts | | | For Straight Bolts. Straight Roughing | For Straight Bolts. Straight Finishing | For 1/8 Taper Bolts. Taper Roughing | For 1/8 Taper Bolts. Taper Finishing | | | Taper Finishing | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Diam. | Length Under Head | Diam. Under Head | Diameter | Diameter | Diameter | Small Diam. | Large Diam. | Handle Diam. | 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

**Fig. 14—Plug Gages for Bolt Turning Machine.**

BORING, ADJUSTABLE CUTTER.

The cutter head, shown in Fig. 15, is a simple and strong tool for cutting 6 to 16-in. diam. holes from the solid, after drilling the hole for the center pin. It is a

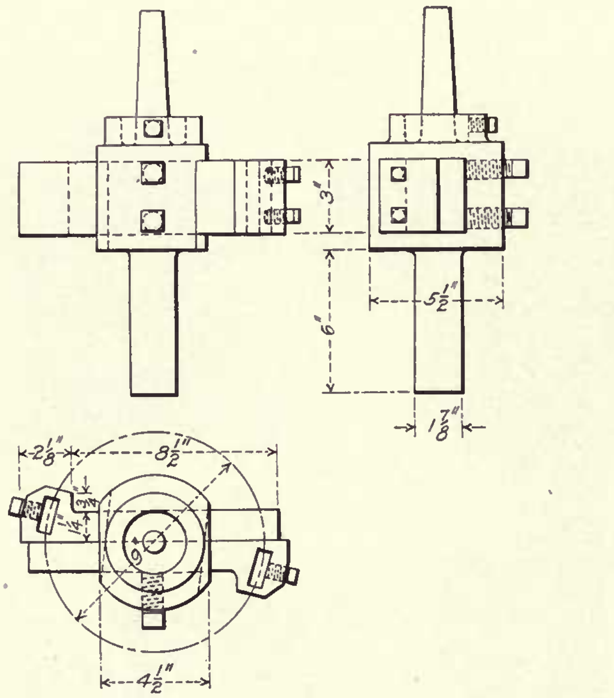


Fig. 15—Adjustable Cutter Head for Drilling or Boring.

good tool for cutting out side rods, working from either side. This method permits the use of short and stiff tools.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

BORING BAR.

The boring bar shown in the photograph, Fig. 16, is used for light work on the boring mill, and can be

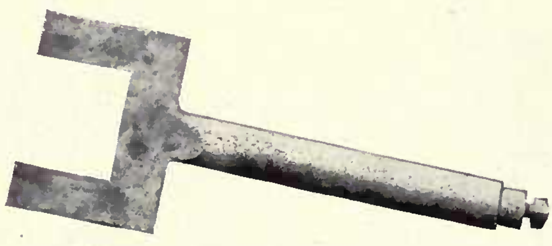


Fig. 16—Boring Bar for Use on Boring Mill.

held in the ordinary tool post. The two parts of the fork are of rectangular section and slip under and are held by the ordinary cutting tool clamp. It can be put in place as quickly as the regular cutting tool and is correspondingly handy.—*Delaware, Lackawanna & Western, Scranton, Pa.*

BORING BAR.

A boring bar for heavy duty, used for boring and slotting locomotive driving wheels on a 90-in. Niles boring mill having a slotter attachment is shown in Fig. 17. A feature of the bar is the clamp at the bottom which secures the tool. This clamp, or bottom plate, has two ¾-in. studs running through it, which provides for securely holding the tool much more firmly than is possible

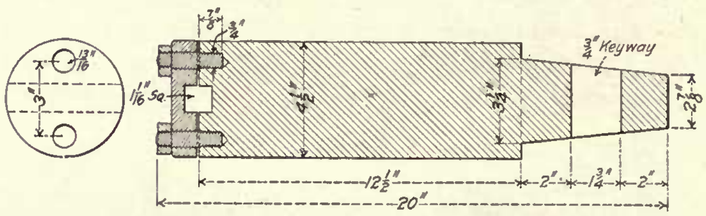



Fig. 17—Heavy Duty Boring Bar.

with a set screw. It is also easier to make the square slot between the two pieces than to make a square hole through the end of a solid bar.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

BORING BAR.

A simple boring bar is shown in Fig. 18. Any size bar can be applied without removing the shank from the

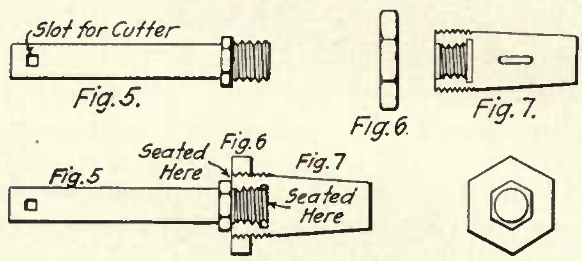



Fig. 18—Boring Bar.

socket.—*A. L. Bauer, Machine Shop Foreman, Terminal Railroad Association of St. Louis.*

BORING BAR HOLDER FOR LATHE.

A boring bar holder used in the place of the ordinary tool post on a lathe is shown in Fig. 19. It has a T-head bolt by which it is clamped to the lathe carriage, and the boring bar is held by two ¾-in. set screws as

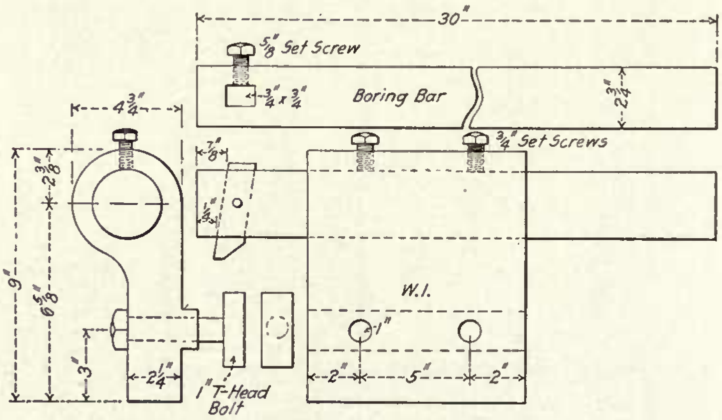



Fig. 19—Boring Bar Holder.

indicated. The bar is 2¾ in. in diameter and 30 in. long. A ¾-in. x ¾-in. tool is fastened in the end of the bar by a ⅝-in. set screw.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

### BORING HOLLOW SPHERES.

A handy device for boring hollow spheres is shown in Fig. 20. In the drawing the piece to be turned is shown in section, and is carried by a chuck or the hollow spindle of the lathe. The tool is carried by a worm gear, supported by a bar held in the tool post. The spindle and worm operate the feed and are turned by a handle. For adjusting, the tool is turned so that the center of the gear coincides with the axis of the lathe spindle. If the center line corresponds with that of the piece, it is fed directly into the work until the center of the worm gear coincides with the center of the curved sur-

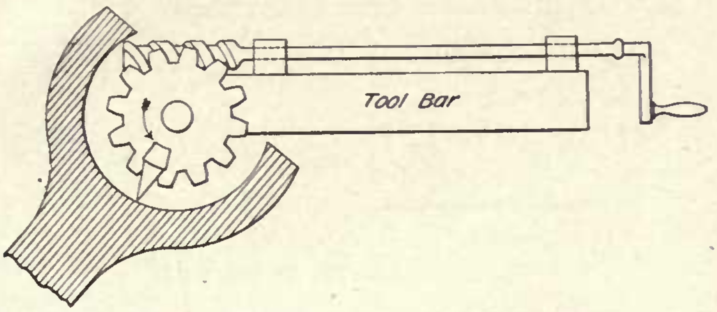



**Fig. 20—Device for Boring Hollow Spheres.**

face. When this is done, the tool is fed through the circumference by turning the hand wheel. With this device, the internal surface of a sphere can be bored through any number of degrees, provided there is an opening of sufficient size on one side to admit the tool. The radius of the surface so turned is equal to the distance from the point of the tool to the center of the worm gear and can only be varied by readjusting the tool. A study of the design will show that it is not necessary to adjust the spindle so that the center line coincides with that of the lathe spindle, although in this position the greatest radius of turning can be obtained.—*Eastern Railroad of France.*

### BORING MILL, ADJUSTABLE CHUCK FOR HORIZONTAL.

In boring oil cellars, grease lubricators, trailer cellars, bearings, etc., in a horizontal boring mill, the wrought iron chuck shown in Fig. 21 has proved valuable in the saving of both time and labor. Two of these chucks are adjusted suitable to the length of the work to be bored, and are clamped to the table of the machine with bolts

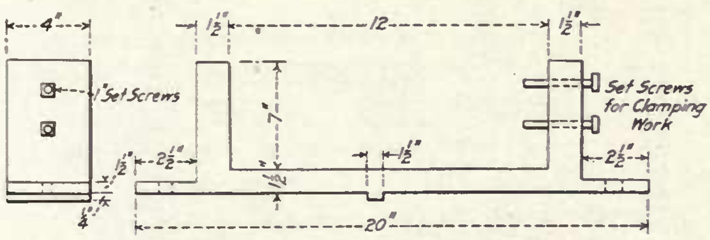



**Fig. 21—Adjustable Chuck for Horizontal Boring Mill.**

in the holes provided for that purpose. The tongue in the bottom of the chuck fits snugly in the slot of the table, thus holding the two chucks parallel to each other. The work is clamped in the chuck by the set screws, which are set at an angle, so as to hold the work securely in place. After once adjusting the chuck and the table for a given job, any number of similar pieces may be adjusted by simply loosening and tightening the set screws in the chuck, as the pieces are removed and replaced.—*John V. Le Compte, Assistant Foreman, Baltimore & Ohio, Garrett, Ind.*

### BORING MILL BRAKE.

A considerable saving of time in stopping a boring mill may be accomplished by the use of a foot brake, as

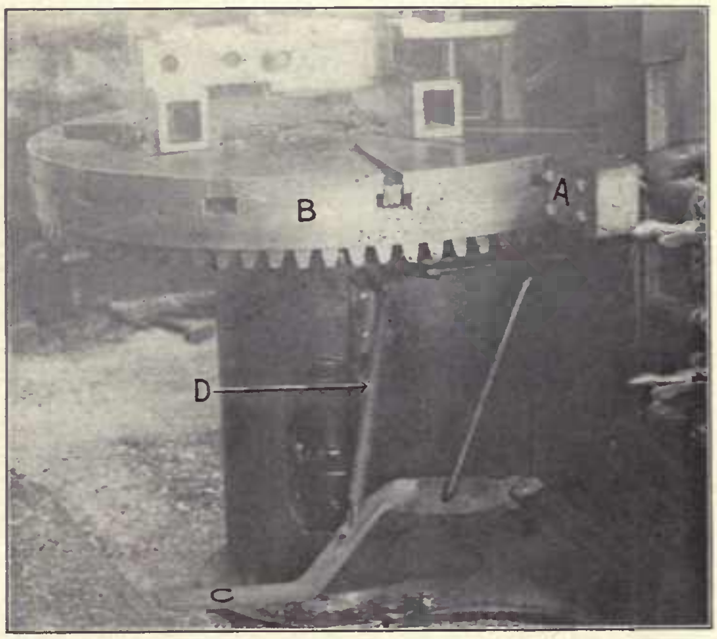



**Fig. 22—Brake on Boring Mill.**

shown in Figs. 22 and 23. The brake *A*, consisting of a block of wood, is connected to the foot brake *C*. When

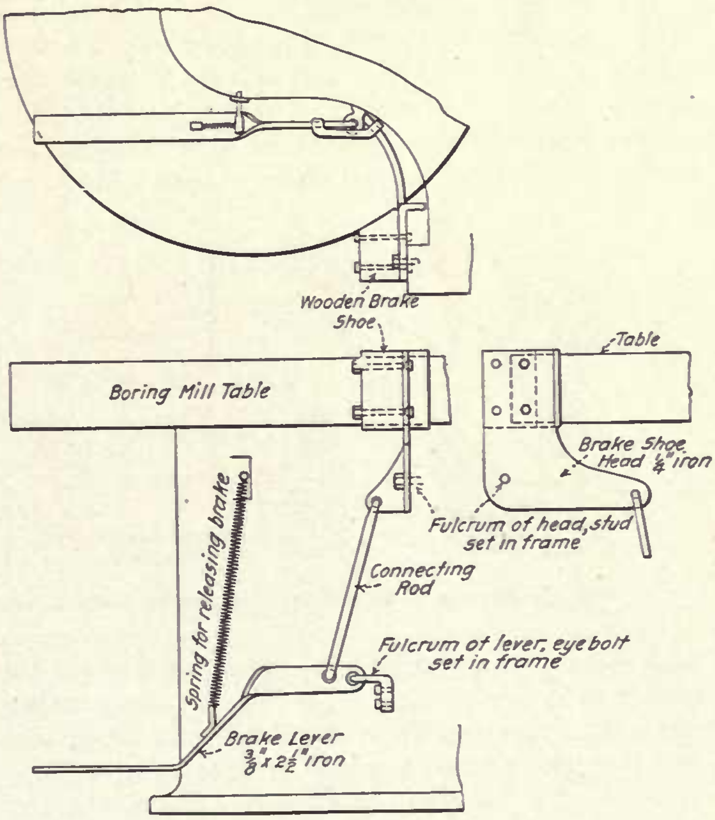



**Fig. 23—Foot Brake on Boring Mill.**

pressure is placed on *C* the brake is forced against the table with sufficient force to stop the machine immediately. When pressure is removed from *C* the spring *D* releases the pressure on the block.—*Chicago & North Western, Chicago.*

BORING TOOL, ADJUSTABLE.

An adjustable boring tool for use in the tail-stock of a lathe is shown in Fig. 24. It consists of two cutting tools, *A* and *B*, held in the chuck *C* by the nut *D*. The

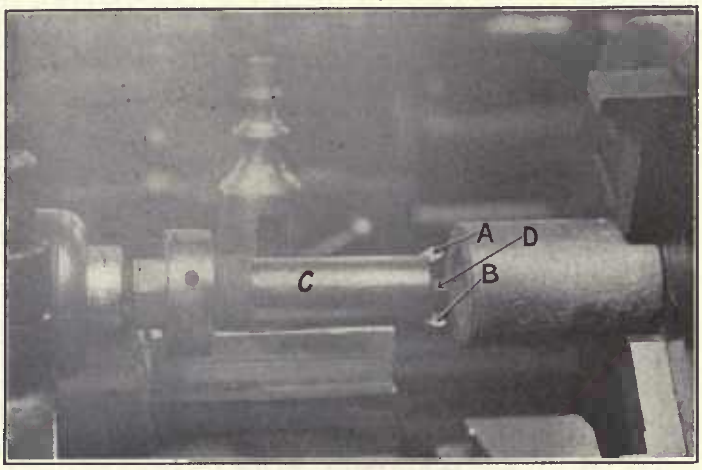



**Fig. 24—Adjustable Boring Tool.**

tools may readily be adjusted. The device is used principally in boring valve motion bushings.—*Chicago & North Western, Chicago.*

BORING TOOL, ADJUSTABLE.

The boring head shown in Fig. 25 has three tools held in place by the bolt in the center. Each tool is tapped at its inner end for a small bolt to provide adjustment as the cutter wears. A sliding gage should be used to grind and adjust these cutters, keeping each set at the same length. Several different sizes of holes can

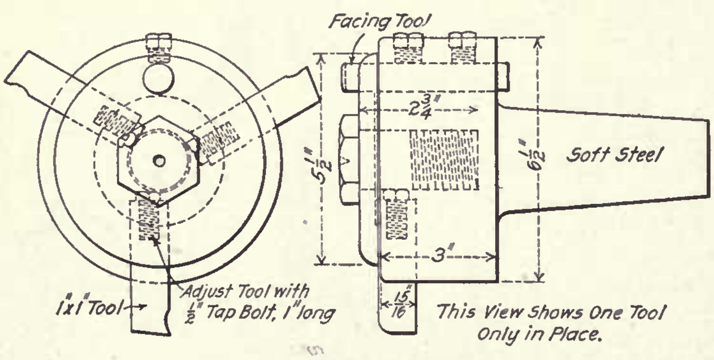



**Fig. 25—Boring Head for Drill or Boring Mill.**

be bored by having small blocks to place back of the screws in the cutter head. The head is also arranged for using a facing cutter. It is possible to chuck, bore and face nine eccentrics with 9 in. holes, 3¾ in. deep, in one hour.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

BORING TOOL, ADJUSTABLE.

The tapered end of the adjustable boring tool, Fig. 26, is made to fit the socket in the lathe tail-stock. A ⅜-in. x 1-in. slot receives the two cutters, which are held in position by the plate that is secured by the screw-head

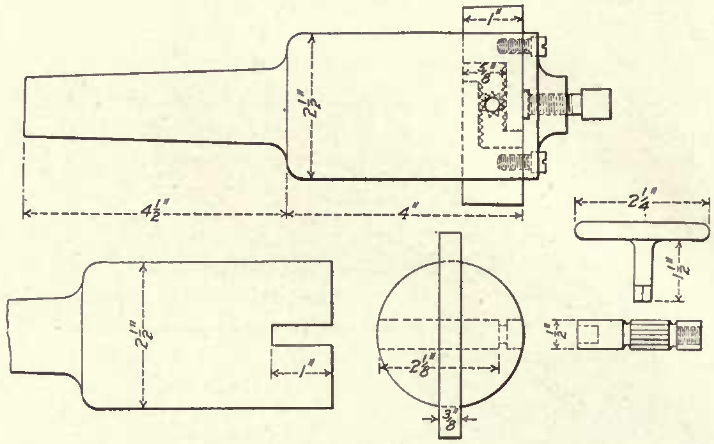


**Fig. 26—Adjustable Boring Tool.**

bolts. These cutters are adjusted by the fluted section of the small spindle, which is operated by a small wrench. After the required adjustment is obtained the cutters are clamped in position by the set screw. The cutters are made of tool steel and the body of the tool is of soft steel.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

BUFFING MACHINE.

A drawing of a swing polishing machine, which is not a new idea, but may be interesting to many readers, is shown in Fig. 27. This machine does all the work of polishing rods, guides, rocker arms, links and motion

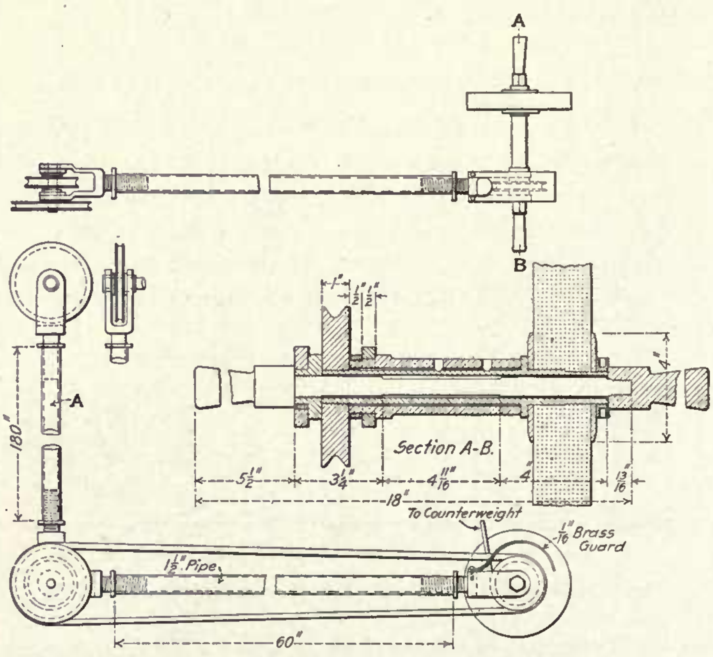



**Fig. 27—Swing Polishing Machine.**

pins and other work for a shop that has an output of from 25 to 30 engines a month.—*D. P. Kellogg, Master*

*Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

BUSHING MANDREL.

A mandrel for turning bushings of various kinds and sizes, especially for motion work, is illustrated in Fig. 28. The nut and sliding portion are removed, the man-

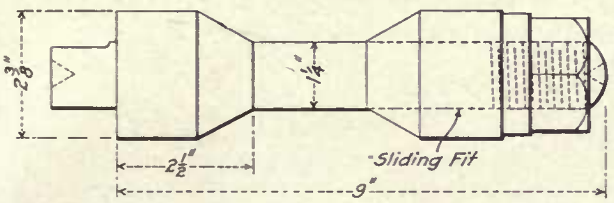



**Fig. 28—Bushing Mandrel.**

drel inserted in the bushing, and the sliding portion and nut re-applied and tightened sufficiently to prevent the bushing from turning. The mandrel is made of tool steel and the conical portions are case hardened. The time and labor required for doing this work have been reduced about 50 per cent. by the use of this style of mandrel.—*A. S. Willard, Foreman, Norfolk & Western, Crewe, Va.*

BUSHINGS, MAKING.

The chucks for drilling and reaming bushings, shown in Fig. 29, are bolted to the side of the drill press table. Bushings are usually made from bars of iron or steel, after the stock has been notched a little deeper than the hole to be drilled, the drill cutting off each bushing at the notch. Bushings made in this way cost about half

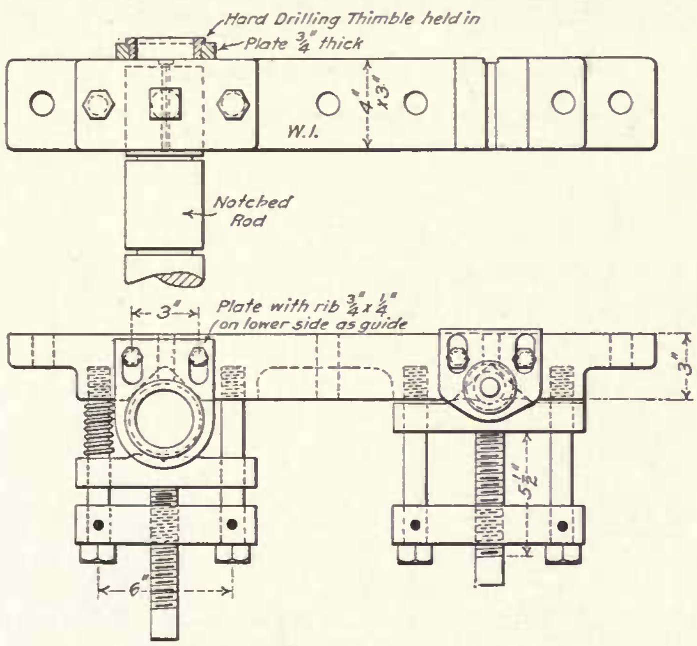



**Fig. 29—Chucks for Making Bushings.**

as much as forged bushings or tubing, which means a very large saving, as all the valve motion, part equalizers, equalizer fulcrums, spring hangers, air-brake hangers, etc., are bushed, using from 80 to 100 bushings on each engine.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

CAR WHEEL BORING MILL, HOIST FOR.

A hoist for handling car wheels to and from a boring mill is shown in Fig. 30. The hand crane attached to the boring mill bed has been displaced by an air hoist of rather novel design. The cylinder, which is 5 in. in diameter and has an 18-in. piston stroke, is mounted directly on the crane arm and swings with it. The over-

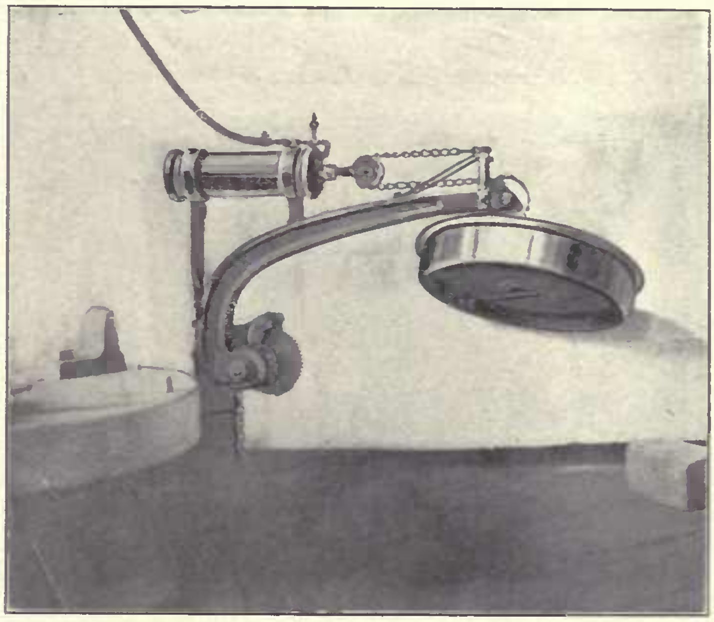


**Fig. 30—Air Hoist for Car Wheel Boring Mill.**

hang of the crane arm is 4 ft. The air cylinder is supported by the wrought iron braces.—*T. E. Freeman, General Foreman; A. G. Wright, Master Mechanic; J. L. Riley, Machine Foreman, Chicago, St. Paul, Minneapolis & Omaha, Sioux City, Iowa.*

COUNTERBORING TOOL.

The counterboring tool shown in Fig. 31 may also be used for boring. It was designed for use on drill presses

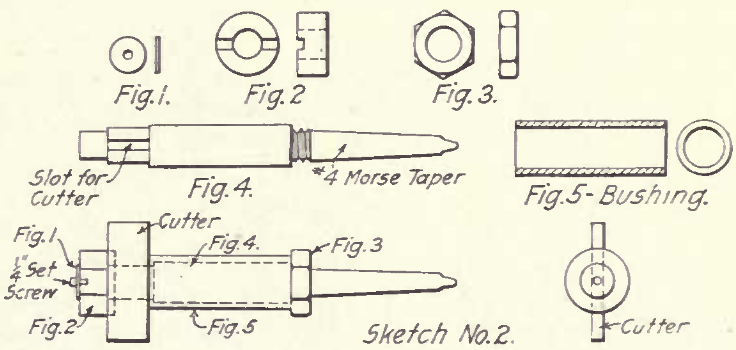



**Fig. 31—Counterboring Tool.**

and lathes. The design, clearly shown on the drawing, is simple and inexpensive.—*A. L. Bauer, Foreman Machine Shop, Terminal Railroad Association of St. Louis.*

CRANK PIN COLLAR, DRILLING SQUARE HOLES.

A tool for drilling square holes in crank pin collars on a drill press is shown in Fig. 32. The collar is placed on two parallel strips and the soft steel cap is then adjusted and clamped in position. This cap centers the work, being bored out to fit over the collar. Inserted in the cap is a hardened steel guide, secured by four pins. This guide has a square of the same size as the square hole to be drilled in the collar. The drill is made of a long piece of steel, as shown, which allows it to give the necessary spring when in operation. The cutting end of the drill is triangular in shape, with a cutting edge on each corner, and is fitted to the guide die so that it will turn free at the four corners. The drawing shows this combination designed for drilling 1¾-in. holes ⅞ in.

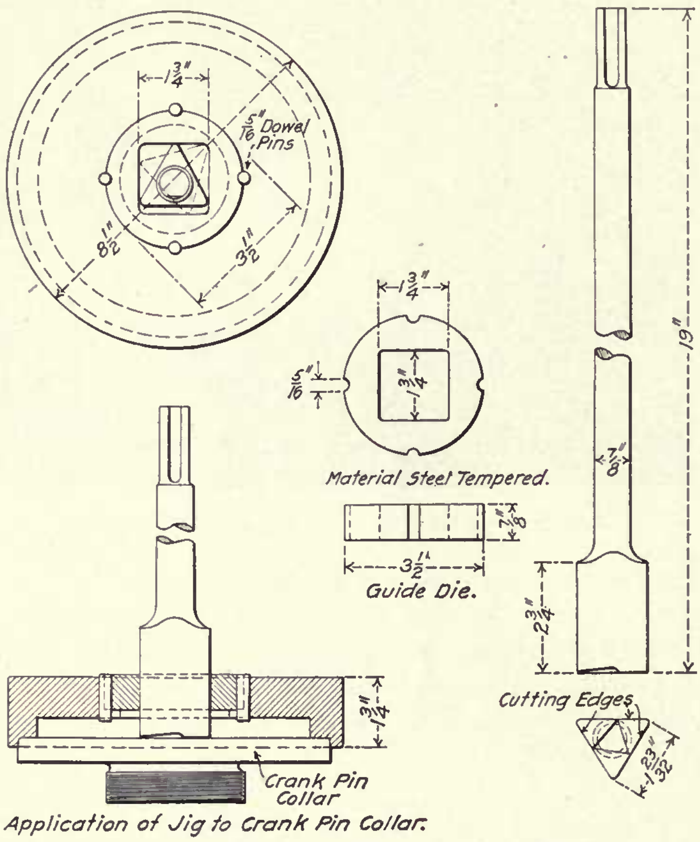



**Fig. 32—Tool for Drilling Square Holes.**

deep. The tool has given very satisfactory results.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and C. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

CROSSHEAD, PLANING.

V-blocks for supporting and clamping the piston rod when planing crossheads on a quick return stroke crank planer are shown in detail in Figs. 33, 34 and 35. They are of simple design, one being an ordinary V-block and the other having an overhang of some 10 in. to provide a more rigid support. Any style of crosshead may be used with them, and as the crank planer is much quicker in movement than other types of machines, it is evident that much time may be saved. These blocks are made of cast iron. The crossheads are planed with the piston rods keyed to them to insure perfect alinement with the rod. A master bar cannot be used because of the difference in taper and the size of holes for the piston rod fit on different classes of locomotives.—*R. E. Brown, Foreman, Atlantic Coast Line, Waycross, Ga.*

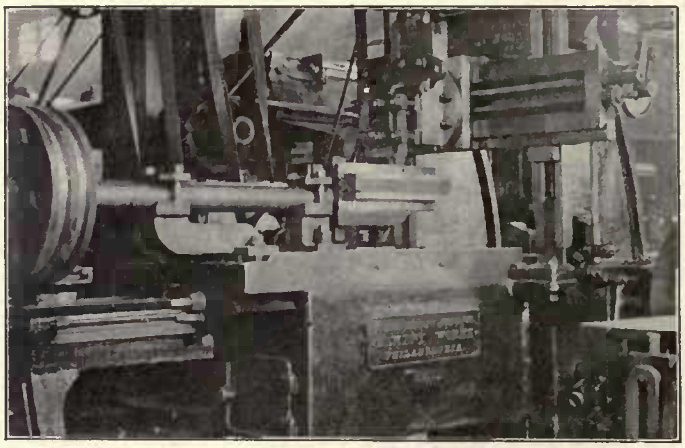


**Fig. 33—V-Blocks for Supporting and Clamping the Piston Rod When Planing Crossheads.**

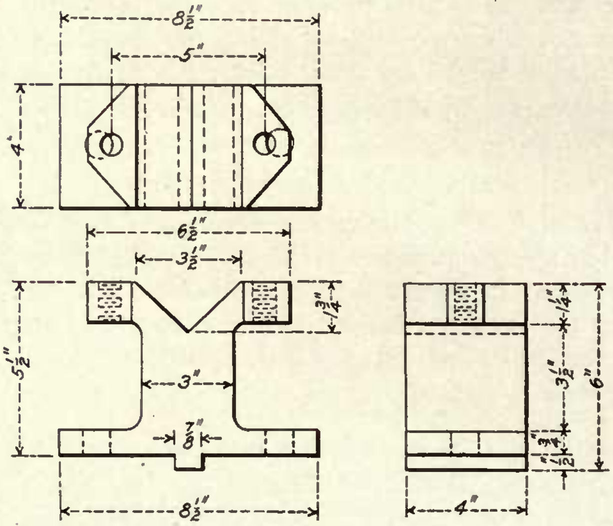


**Fig. 34—Ordinary V-Block for Use on a Crank Planer.**

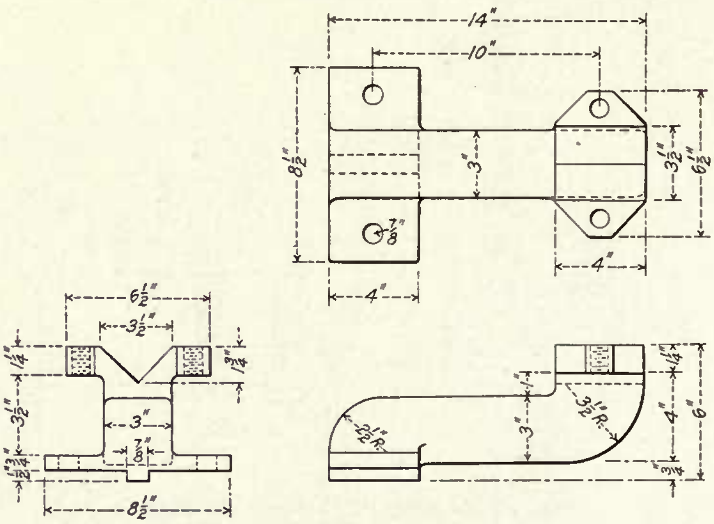


**Fig. 35—Overhanging V-Block for Use on a Crank Planer.**

CROSSHEAD, PLANING.

An alligator crosshead chucked on a planer bed in position for planing the babbitted shoe is shown in Fig. 36. The tool used is 4½ in. wide. The shavings removed are seen to be wide and heavy. It acts largely as a scraping tool and makes a true, even finish, with no

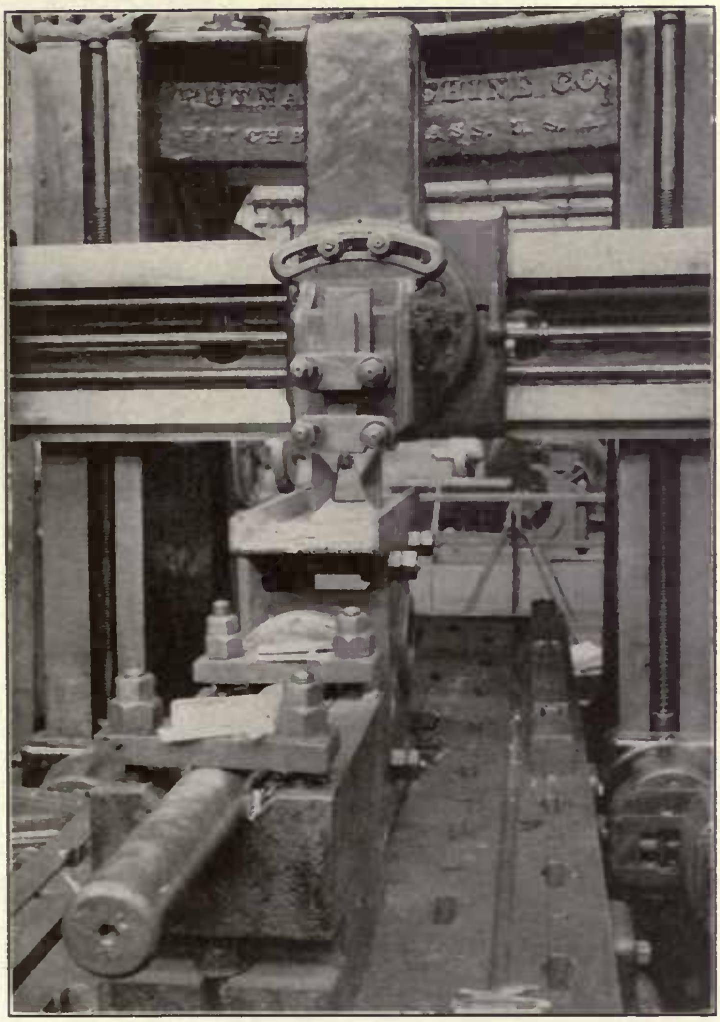


Fig. 36—Planing a Babbitted Crosshead Shoe.

possibility of gouging into the soft metal.—*Lehigh Valley, Sayre, Pa.*

CROSSHEAD, PLANING.

A simple but efficient design of pedestal V-blocks for planing crossheads is shown in Fig. 37. The base lugs

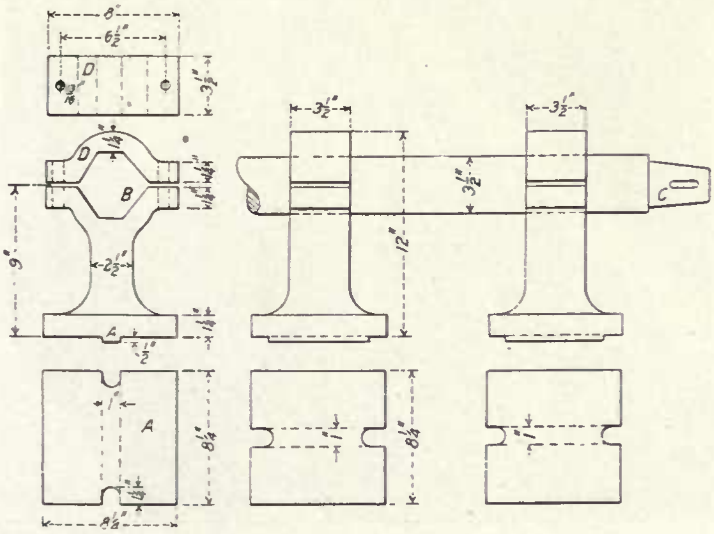


Fig. 37—Pedestal V-Blocks for Planing Crossheads.

are made to fit in the planer slots; the crosshead is planed while mounted on the piston rod and perfect alinement is thus insured.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

CROSSHEAD WRIST PIN, GAGE FOR.

A gage for wrist pins is shown on the accompanying photograph, Fig. 38. It consists of two plates, each about ¾ in. thick, and held about 2½ in. apart by bolts

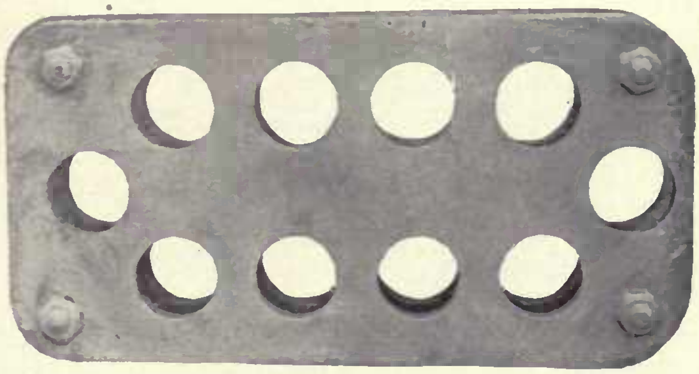


Fig. 38—Wrist Pin Gage.

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.—*Delaware, Lackawanna & Western, Scranton, Pa.*

CYLINDER BUSHING CHUCK.

One view of a cylinder bushing chuck which is easily and quickly adjusted in the bushing and grips it firmly is shown in Fig. 39. The four dogs on each cone are

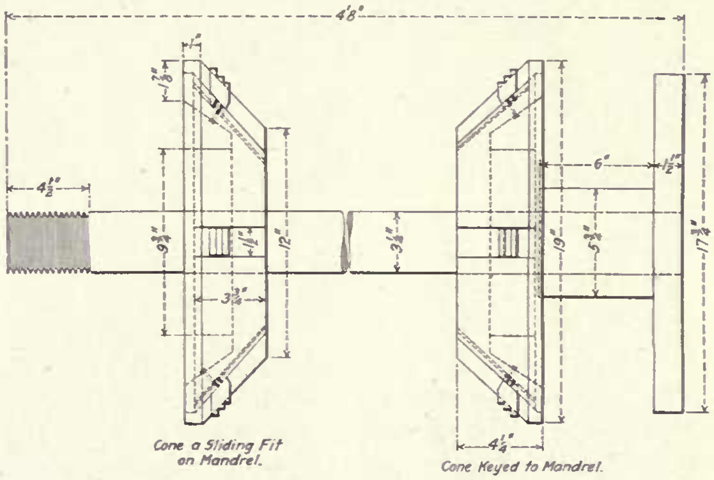



Fig. 39—Cylinder Bushing Chuck.

first set for the bushing diameter and are fixed in place by the tap bolts shown. One cone is keyed on the shaft, while the other is a sliding fit and is clamped against the bushing by a large nut. But two cuts are necessary in machining a bushing, the roughing cut removing about ¼-in. of metal. The finishing cut takes out any spring which may have resulted from the first cut.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

CUTTINGS, BOX FOR HANDLING.

The work of removing machine cuttings from a large shop is an important item; the practice of having it done by laborers with wheelbarrows is expensive and is not entirely satisfactory. The photograph, Fig. 40 shows a chip box, a number of which are located about the shop, especially near the large machines. These boxes are 36 in. x 36 in. x 36 in., made of ¼-in. boiler steel and will hold about 2 tons of chips. The practice is for each operator to throw the cuttings from his machine into a

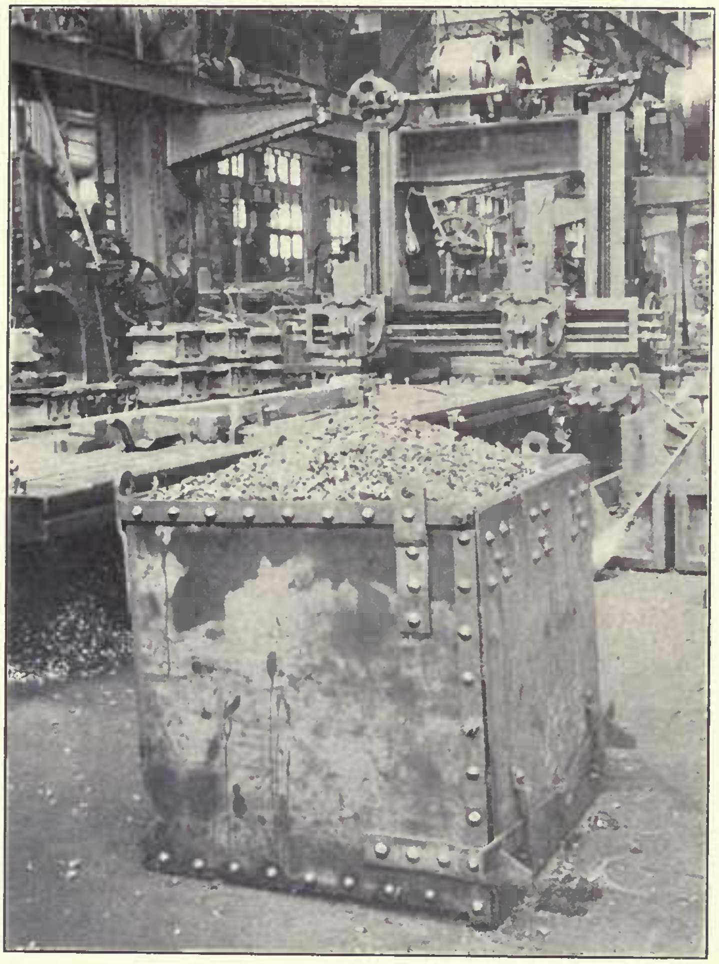


Fig. 40—Metal Box for Handling Cuttings.

box. There is no difficulty in getting this done, as the mechanic shovels the cuttings up as they accumulate, his machine being supplied with the necessary broom and shovel. After working hours in the evening, the shop crane handles these boxes to a scrap car, which is run into the shop. The box has four grabs; one side which is hinged at the top has a latch at the bottom and provides for easily emptying the boxes when suspended over the scrap car and held by the two back grabs only—*Lehigh Valley, Sayre, Pa.*

CYLINDERS AND BUSHINGS, BORING.

A Barrett Bros.' horizontal cylinder boring machine, used exclusively for boring cylinders and cylinder bushings, is shown in the photographs, Figs. 41 and 43. The V-s, adjustable for 12-in. to 40-in. diameters, rest on

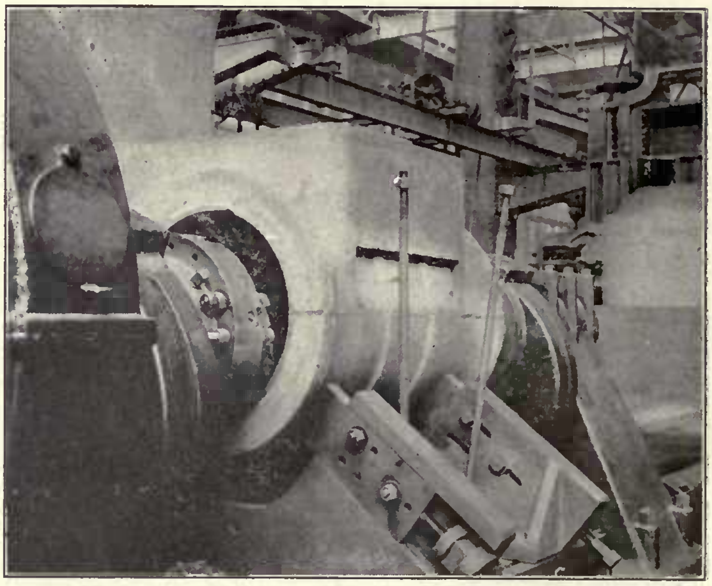


Fig. 41—Cylinder in Place for Boring.

cast iron parallels which are bolted to the bed of the machine. They also move longitudinally on the parallel strips, having wide feet to give stability and to provide for the holding bolts. Both cylinders and bushings are bored and faced to length on this machine. The boring head was designed and made at the Sayre shops. Fig. 42 shows a face view of the head with the bar drawn back. Provision is made for using six tools. Each one is adjusted by a screw, the end of which is shown. The lower end of the screw adjustment carries a right-angle

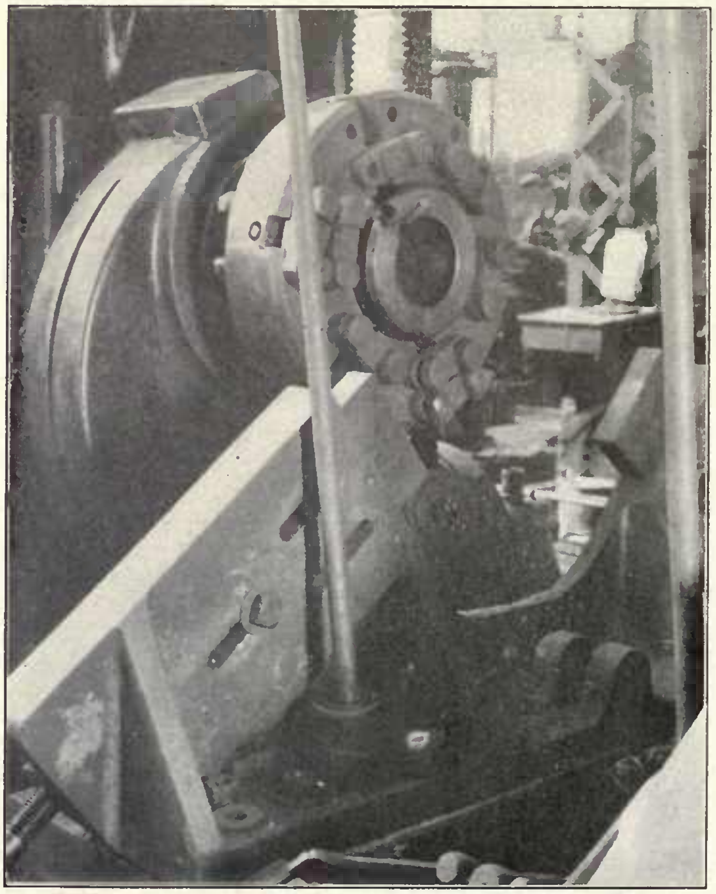


Fig 42—Boring Head of Cylinder Boring Machine.

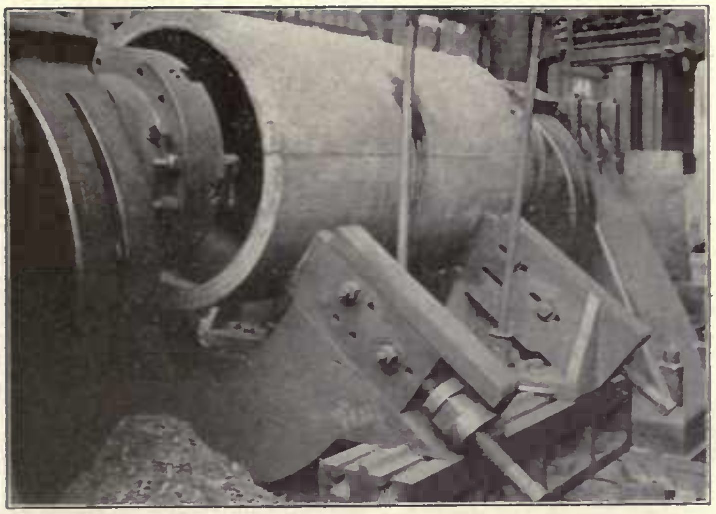


Fig. 43—A Cylinder Bushing About to be Clamped Preparatory to Boring.

hook against which the cutter rests. The tools are set out the proper distance from the head by measurement, so that it is not necessary to run trial cuts and caliper the cylinder or bushing; a considerable amount of time is thus saved.—*Lehigh Valley, Sayre, Pa.*

CYLINDERS AND BUSHINGS, BORING.

It formerly required 12 hours to bore an 18-in. cylinder, this being measured from the time the cylinder was taken off the floor until it was returned. This is now being done in nine hours, and the time will be reduced still more when the chuck shown in Fig. 44 has been installed. *A* is a section of the bed of the cylinder boring machine, and *B* is the base of the chuck, which may be used either for a cylinder bushing or a cylinder casting. The method of chucking one of the bushings is clearly shown in the

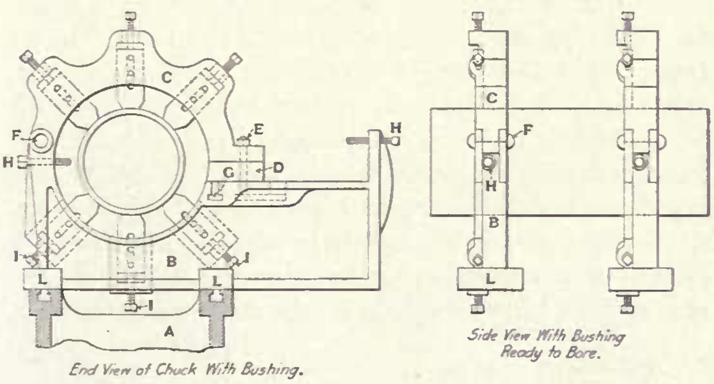



Fig. 44—Chuck for Boring Cylinders or Cylinder Bushings.

illustration. To use this chuck with a cylinder it is necessary to remove the part *C* by taking out the bolt *E* and removing the block *D* and the pin *F*. The cylinder may then be placed on the base and adjusted to the proper position by manipulating the screws *I* and *H*. The casting may be securely clamped in position by means of two cross bars, one at each end of the cylinder, one end of the bars being held by eye bolts which fit on the pins *F*, and the other by T-bolts, which fit in slots *G*. The lugs *L* are bolted to the base of the machine by two bolts each.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

CYLINDER BUSHINGS, MACHINING.

A method of boring and turning cylinder bushings at one operation on a vertical boring mill is shown in Figs. 45 and 46. The rough bushing is made 4 in. longer than

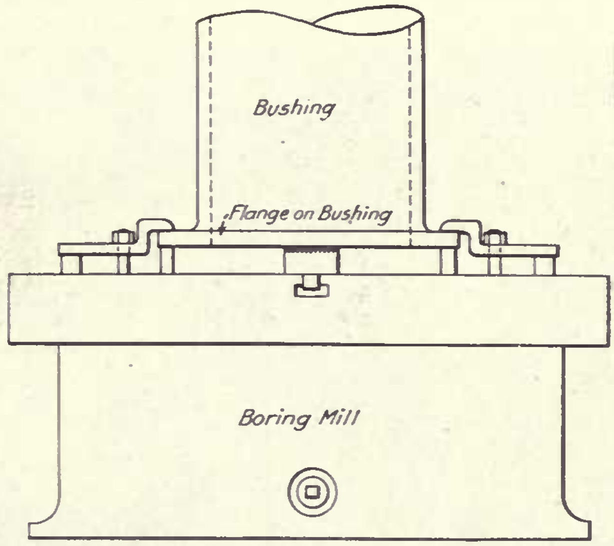



Fig. 45—Cylinder Bushing Clamped to Boring Mill Table.

the cylinder, with a flange at one end for clamping. After clamping it to the table, one head of the boring mill may be used for turning and the other for boring. This re-

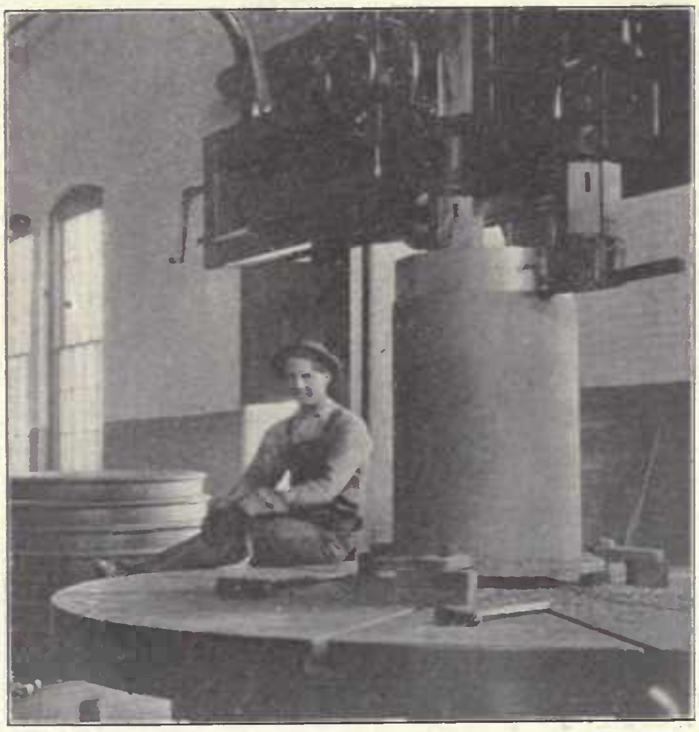


Fig. 46—Turning and Boring a Cylinder Bushing in One Operation.

quires about one-half the time of the old method and eliminates any liability of the bushing being sprung out of round.—*R. E. Brown, Foreman, Atlantic Coast Line, Waycross, Ga.*

### CYLINDER HEAD CHUCKS.

The design and application of a set of dogs used in machining cylinder heads on a boring mill are shown in Figs. 47 and 48. There are three such dogs in a set and they are made of soft steel. The gripping face, 7/8-in. in depth, has teeth set at an angle of 60 deg. with the horizontal and opposed to the direction of motion of the machine, so that any tendency to slip forces the teeth

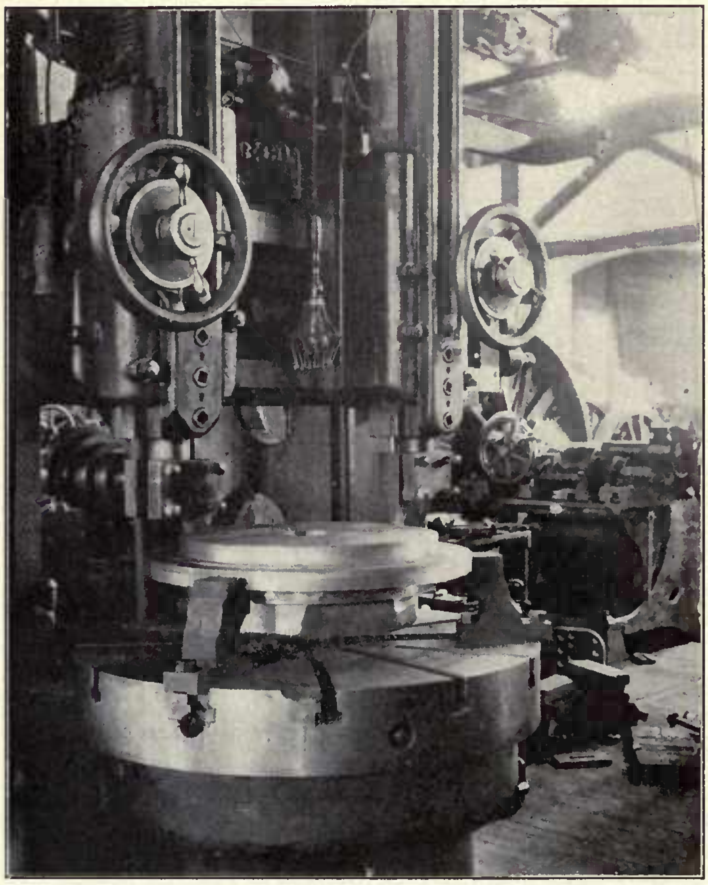


Fig. 47—Application of Cylinder Head Dogs to a Boring Mill.

more firmly into the work and wedges it more securely against the horizontal surface on which it rests. Each dog has two holding bolts which tap into a cleat, fitting in the universal chuck strip in the machine bed. A section of the base of the dog is supplied with teeth to mesh with those in the strips. These dogs are designed to take all of the cylinder heads used on the road. Although the chucks are used on a 42-in. high-power, double-head Gisholt mill, they give satisfactory results under the most

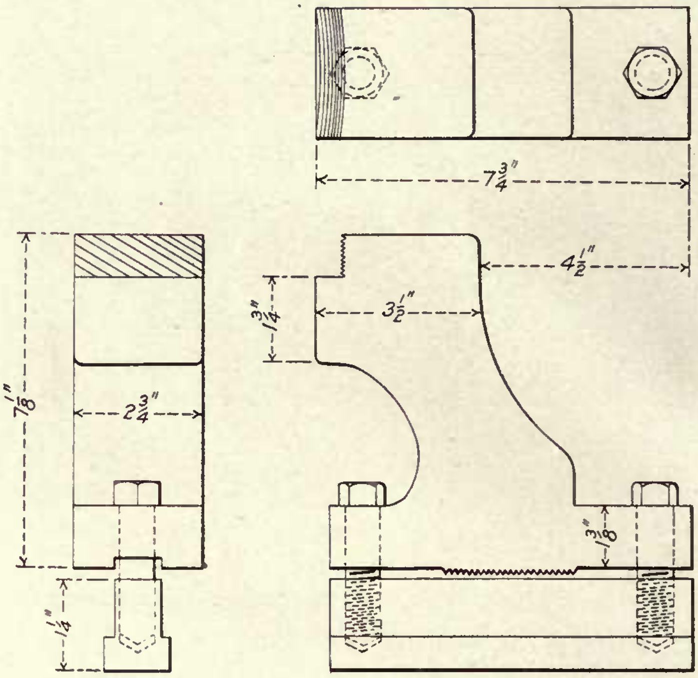


Fig. 48—Cylinder Head Dog.

severe conditions.—*Long Island Railroad, Morris Park, N. Y.*

### CYLINDERS, CHUCKS FOR PLANING.

The chucks, shown in the photograph, Fig. 50, and the drawing, Fig. 49, are made to accommodate all sizes of cylinders from 18 in. to 25 in. in diam. The steps on the cones fit the counterbores of the different size cylinders. The set consists of two end and two centre chucks. One of the center chucks is made long (the one shown to the right in Fig. 49), since some of the cylinders have frame fits extending beyond the ends of the cylinders. If the frame fits do not extend beyond the cylinders, a short center is used (about 9 in. wide over-all except for the base, which is 12 in. wide), bringing the cylinders closer together and saving considerable time in planing. The gap at the top of the chucks is provided to lighten them, and is also useful in placing the two large bolts which are used to draw the chucks tight against the cylinders. The chucks should have the steps on the cones machined first,

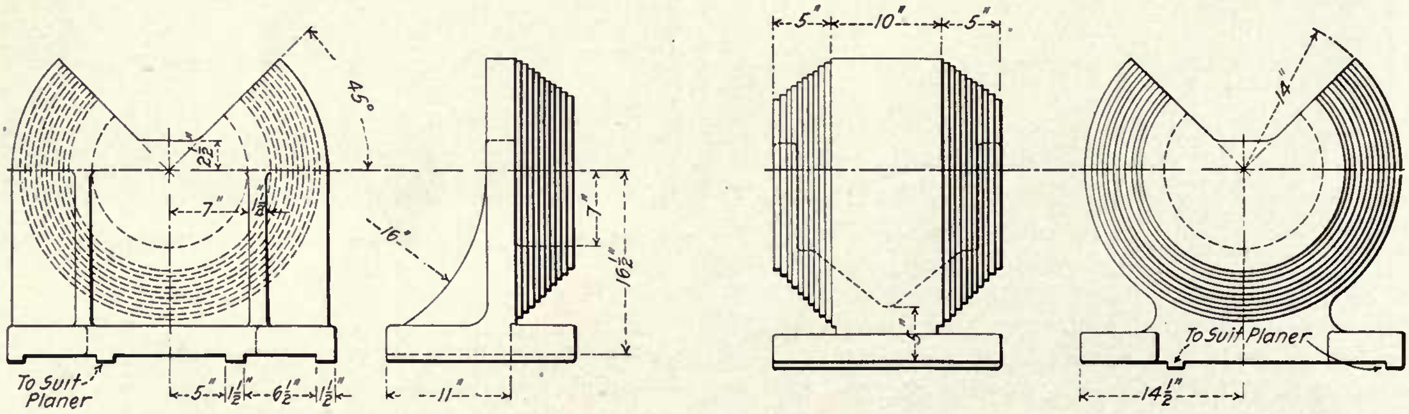



Fig. 49—Details of Cylinder Chucks.

after which the center hole should be bored out. They should then be placed on a mandrel and finished to fit the slots in the planer bed. With these chucks, it is possible

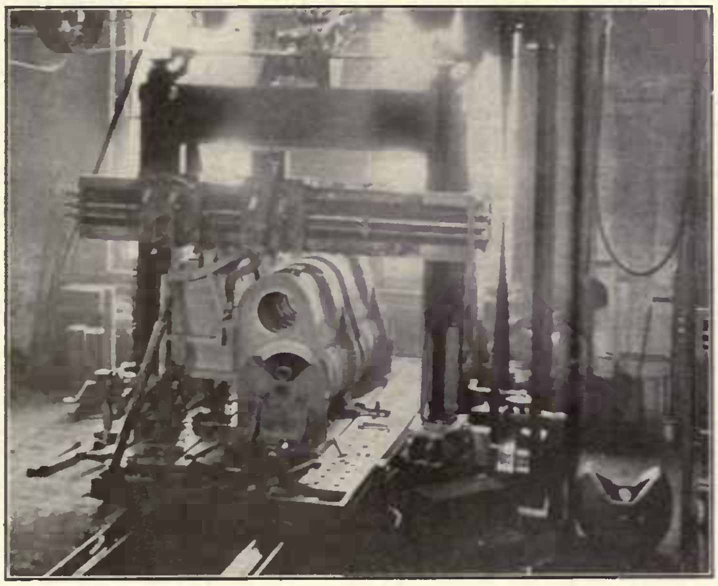


Fig. 50—Cylinders and Chucks in Position on Planer.

to set up and bolt a pair of cylinders ready for planing in one and a half hours.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

DIE HOLDER, COMBINATION.

A combination die holder, used principally on the turret lathes for brass work, is shown in Fig. 51. This style of die holder has given perfect satisfaction, and as it is adjustable, the dies can be reground without chang-

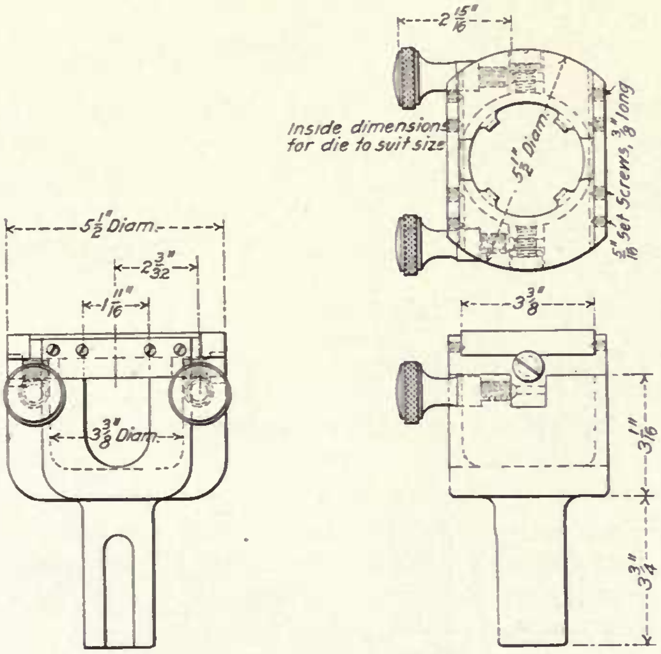



Fig. 51—Combination Die Holder.

ing the size of the holder. The die is removed from the cage by loosening the knurled screws. A large number of dies can be used with the one holder. The size shown is for use on standard hose nipples, water car nipples or any work between 2 and 3 in.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and C. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

DOVE-TAILING AND COUNTERBORING TOOLS.

The dove-tailing tool shown in Fig. 52 is for use after a hole is made with an ordinary flat bottom drill. When the end of the dove-tailing tool reaches, and is pressed against the bottom of the hole, the cutter is forced out, making a dove-tail such as is often used to anchor babbitt in crosshead shoes, driving boxes, etc.

The counterboring tool, shown in the same illustration, was designed especially for reaming frame bolt holes of cylinders. As these holes are 18 in. long, they are very difficult to ream. With this tool the center of the hole is counterbored for about 6 or 8 in., after which the

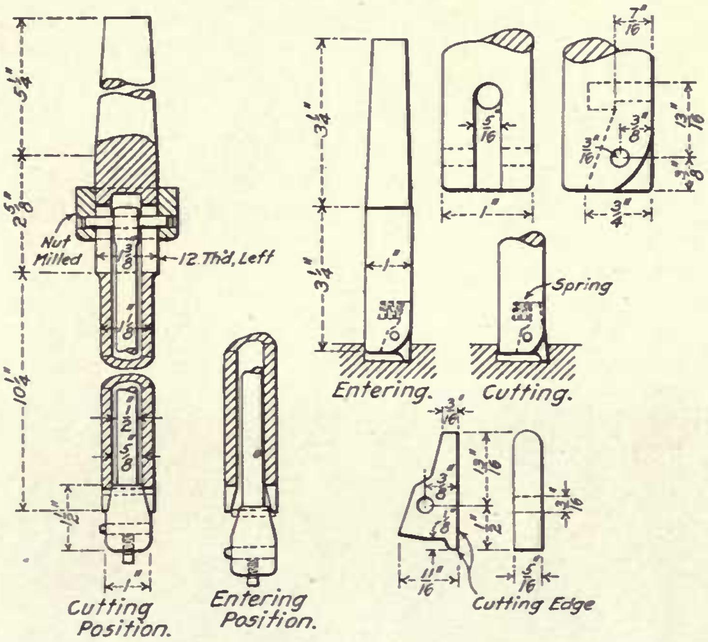



Fig. 52—Dove-Tailing and Counterboring Tools.

holes can be reamed in about half the time formerly required. In operation, the cutting tool is first set and fastened with a set screw. The milled nut is then screwed down so that the cutter does not project beyond the body of the tool. The bar is then entered in the hole from the bottom; the motor is started, and the tapered head holding the cutter is drawn into place by tightening the milled nut, forcing the cutter into the metal.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

DRILL GUIDE.

A simple guide for drilling a series of holes which run into each other in the base of a rail is shown in Fig. 53. The guide was made especially for use in connection with cutting planer clearance slots in a number of standard section rails, the flanges of which were being planed down for guard rails. Although it is a special tool, it illustrates an application which may be used on any job requiring a series of consecutive drilled holes. A slight change in the design of the piece which holds the hardened bushing would be necessary for any work other than a rail. The guide is held in place on the rail by driving in the wedge which draws the loose key against the

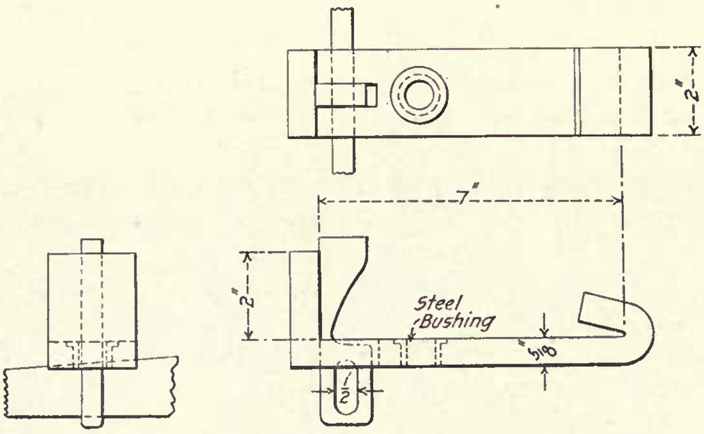



Fig. 53—Drill Guide.

flange. This idea is one which is used very extensively at the Long Island shops, on all sorts of jigs and chucks. It replaces the nut which is usual in such cases, being much more quickly operated. The body of the device is made of wrought iron or soft steel and the drill bushing of hardened steel.—*Long Island Railroad, Morris Park, N. Y.*

DRILL PRESS CLAMP.

A clamp for holding ash pan castings on a drill press table is shown in Fig. 54. The clamp *A* revolves on the

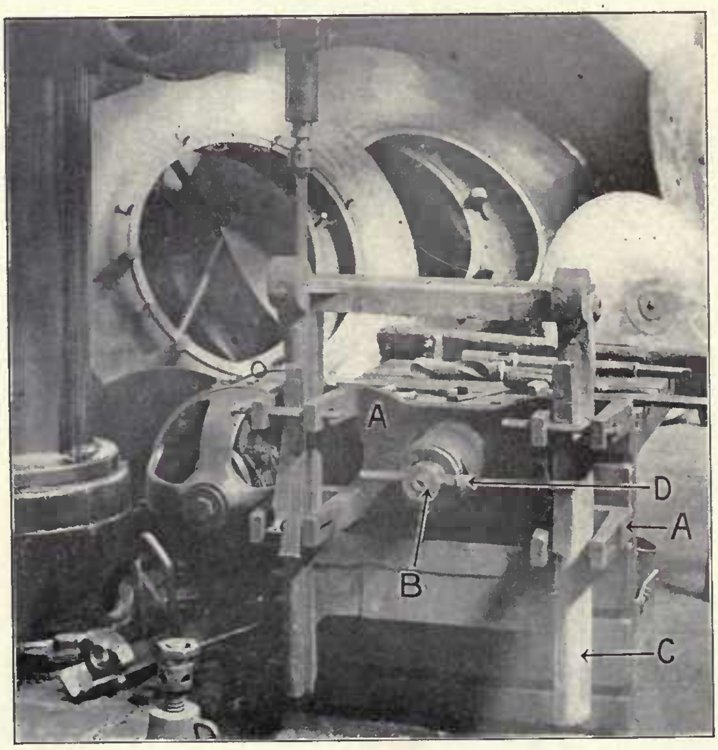



Fig. 54—Clamp for Holding Ash Pan Casting on Drill Press.

shaft *B*, which is bolted to the drill press table. The casting *C*, which is held by the clamp, may be placed in any position for drilling by driving out the key *D* and turning on the pin *B*.—*Chicago & North Western, Chicago.*

DRILL PRESS CLAMP, PNEUMATIC.

A pneumatic clamp applied to a drill press is shown in Fig. 55. All the heavy radial drills in our shop are equipped with this attachment. The clamp holds the work securely and is quick to operate. It is made adjustable to suit any size of work, and saves the time of

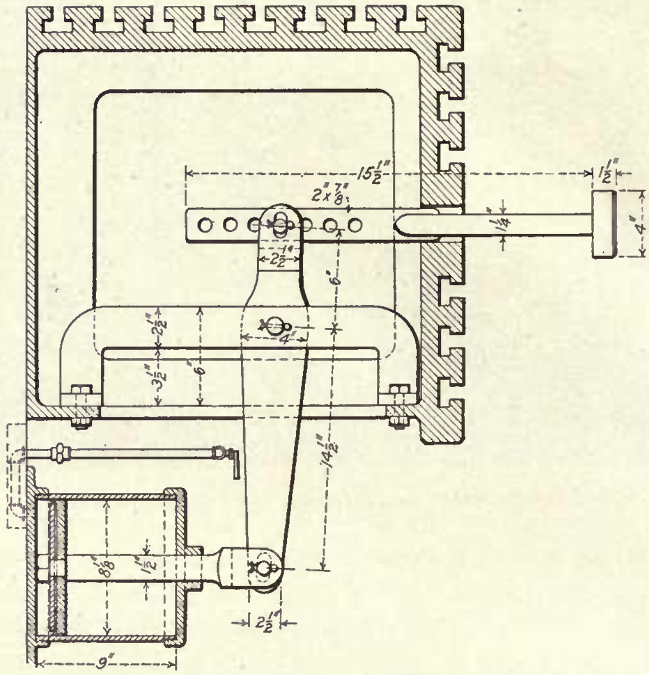


Fig. 55—Pneumatic Clamp Applied to Drill Press.

loosening and tightening nuts, which amounts to considerable in a month's time.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodman, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

DRILL SOCKET FOR FLAT DRILLS.

Flat drills, when used in drill presses or with air motors, are generally unsatisfactorily held, usually with a set screw or even nothing but a square socket to take the rough forged shank. The chuck here shown, Fig. 56, consists of two main pieces and two semi-circular steel

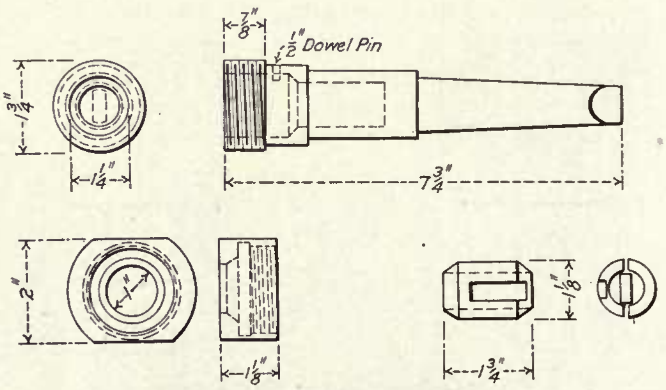



Fig. 56—Flat Drill Chuck.

blocks which grip the round shank of the drill. In the drawing, the top view of these steel blocks shows also the relative position of the flat portion of the drill, the round not being shown. These blocks fit in the head of the chuck and are held from falling, in case the lower cap be removed, by a ½-in. dowel pin. After placing the round shank in the chuck and forcing it up between the steel blocks, the cap is screwed up and the taper faces of the blocks, fitting against similar tapers in the cap and head of the chuck, cause the blocks to firmly clamp the shank of the drill. Flat drill shanks from ¼-in. to ⅜-in. in diameter may be used with a chuck of the dimensions shown. The Morse taper shank in this case is made to fit a No. 3 sleeve.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### DRILL SOCKET FOR SQUARE SHANKS.

A handy chuck for using square shank taps or reamers on a drill press is shown in Fig. 57. The body *A* is bored out to receive the collet *C*, which has a square opening to fit over the shank of the reamer or tap. A set of these collets should be provided having squares ranging from ¾ in. to 1½ in. After placing the collet

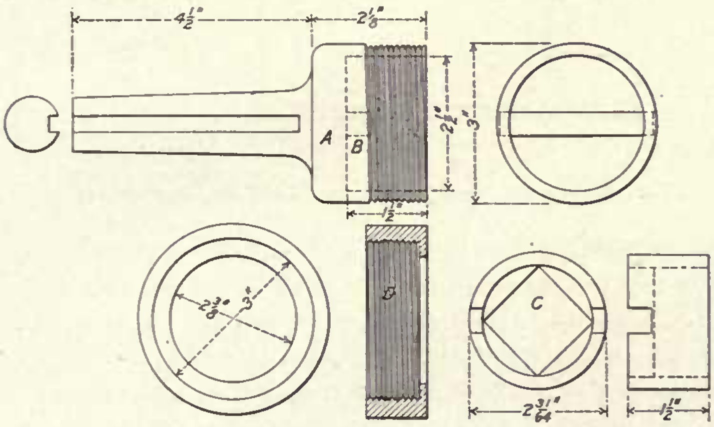


Fig. 57—Drill Press Chuck for Square Shank Tools.

in the retaining collar *D*, it is screwed on to the body *A*, clamping the collet firmly. The dowel pin, indicated at *B*, prevents turning. The collets are made of tool steel and the other parts of soft steel.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### DRIVING BOX BORING BAR.

A double tool boring bar for finishing driving box bearings is illustrated in Fig. 58. The lower end of the bar fits in a bushing in the table of the boring mill. The head carries two tools, one for roughing and the other for finishing, both of which are made of 1-in. square steel. The finishing tool is first applied and about ¼-in. depth of metal is removed in order to get the proper size. The roughing tool is then adjusted to leave 1/32-in. to be removed by the finishing tool and is set to lead the finishing tool by ⅛ in. This operation therefore roughs and finishes the bearing simultaneously. After the box is finished the tool is moved back to the top and the box is revolved once to make sure it has not been moved while the cut was being taken. Before the box is removed it is moved from ¼ in. to ⅜ in. away from the center and a cut is run through to remove the metal below the horizontal diameter line and at the retaining shoulder, thus eliminating the necessity of any chipping in the erecting shop in order to get the box to fit down over the journal.

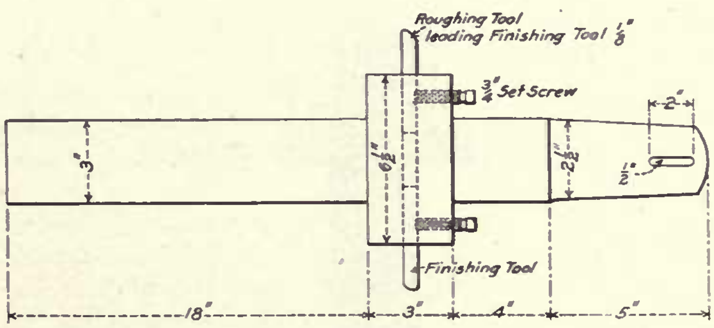



Fig. 58—Driving Box Boring Bar.

The entire operation saves about 50 per cent. of the time formerly required for doing this work.—*John V. Le Compte, Assistant Foreman, Baltimore & Ohio, Garrett, Ind.*

### DRIVING BOX BRASS CHUCK.

Driving box brasses may be machined to the press fit sizes in a lathe to better advantage than on a slotter. On a slotter it is necessary to allow the tool to pass completely around the bearing—or at any event, to make at least a few cuts on either end of the diameter of the brass—in order to caliper the size. When machining on a lathe, a few revolutions of the work suffice to give the

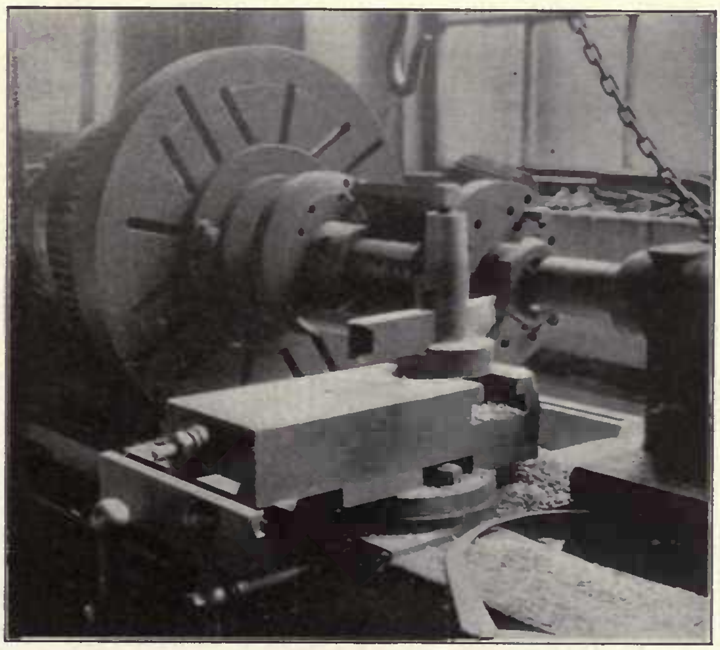


Fig. 59—Driving Box Bearing Chuck.

desired measurement. The chuck shown in the lathe, as illustrated in Fig. 59, has two cones, one of which is adjustable on the spindle. Besides being held between the cones, set screws are also used for gripping the brass. These chucks will take bearings for from 8-in. to 10-in. journals, the cones being well supplied with set-screw holes.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### DRIVING BOX BRASS CHUCK.

The chuck shown in Fig. 60 consists of a heavy base slotted at the edges to admit holding bolts, and with a mandrel projecting upward, to the end of which a sliding

**Fig. 60—Chuck for Turning Driving Box Brasses.**

collar and nut are fitted. The brass is set on the lower collar and the upper one is dropped down and adjusted with the set-screws and then tightened in place by the nut. It is intended for use on a boring mill.—*Delaware, Lackawanna & Western, Scranton, Pa.*

### DRIVING BOX BRASS CHUCK.

Driving box brasses are turned on a center-drive axle lathe, using the turning bar shown in Fig. 61. Two brasses can be turned in a half hour, or 15 minutes to the brass. The bar, which is 5 ft. 8 in. long, is made from a scrap axle. Details of the driving dog and the steady and grip flanges are shown. The grip flanges are made in different diameters to suit brasses of various sizes, the

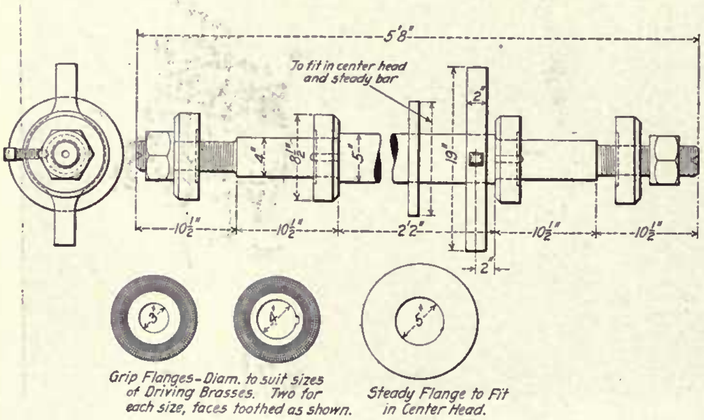



**Fig. 61—Turning Bar for Locomotive Driving Box Brasses.**

diameter of the grip flange being that of the finished brass. These flanges are a sliding fit on the bar. The steady flange fits in the center head of the lathe to steady the bar. These turning bars are being used in all of the shops of the road. The same kind of lathe is also used for driving axles, saving much time.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

### DRIVING BOX BRASS CHUCK AND GAGE.

A V-block for setting driving box brasses on a planer bed is shown in Fig. 62. This block is held in place on the planer by the lug at the bottom, which fits the slot in the platen. The brass, which has been previously machined on the lathe or on a vertical mill, is placed on the V-block, and is held in position by a long clamp and

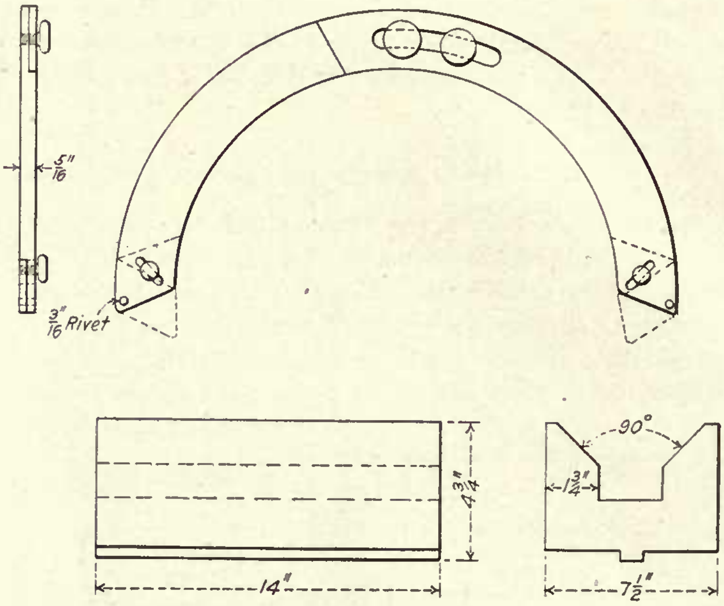



**Fig. 62—Chuck and Gage for Driving Box Brass.**

bolts, which latter also hold the V-block to the planer. The tool for obtaining the size of the brass from the box is also shown. It is adjusted to the box size by the thumb screws, and the end lugs are adjusted to the proper angle of the retaining shoulder. After the gage is adjusted to size it is placed against the end of the brass, which is marked off accordingly.—*L. M. Granger, Assistant General Foreman, and John Todd, Machine Foreman, Erie Railroad, Galion, O.*

### DRIVING BOX BRASS CHUCK AND GAGE.

The driving box brass chuck, Fig. 63, is made in three sizes: one for 7 to 7½-in. x 8-in. journals; one for 8 to 8½-in. x 10 in. journals, and one for 9 to 9½-in. and 10-in. x 12-in. journals. There are also three sizes of gages, one for each chuck. The frames of the gages are constructed of ⅛-in. steel ½ in. wide. The small piece with the 4¼-in. radius, shown at the right on the drawing, is used with the smaller size gage only. The circle of the box is first calipered and the points on the gage set accordingly. The gage is then laid on top of the brass and the cutting tool is set to the gage points, making allowance for the finishing cut. After the radius is slotted, the gage, which meanwhile has been fitted to the box to get the proper angle of the dove-tail, has the small angle piece of 3-16 in. round iron fastened against the middle point of the gage. The projecting arm of the angle piece is pressed against the brass and the dove-tail is scribed. The assembled view of the gage shows it arranged for this purpose. After the dove-tail is slotted to the line, the gage is placed on top of the brass and a scale is held against the dove-tail to check the work. This tool has been used for slotting brasses for several years; but one operation is required instead of three or four, as when the brasses are turned in the

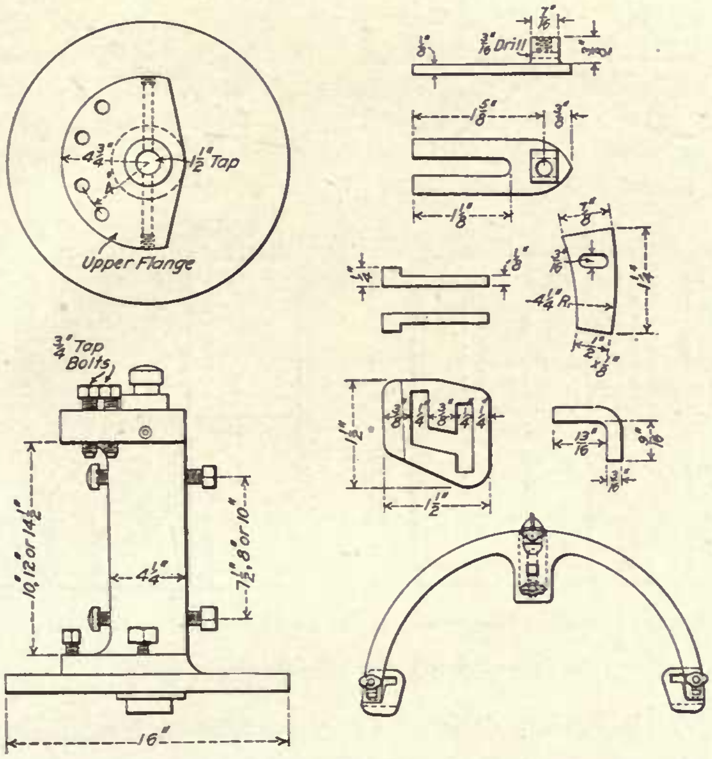



**Fig. 63—Driving Box Brass Chuck for Slotter and Gage for Laying Out Brasses.**

lathe, after which the dove-tail is cut on a shaper or slotter. Brasses are slotted and pressed-in in 35, 40 or 45 min., according to the size, making perfect fits without filing.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

### DRIVING BOX BRASS GAGE.

In fitting locomotive driving brasses into the boxes it is customary to turn off the circumference of the brass in the lathe to the diameter of the box, after which it is

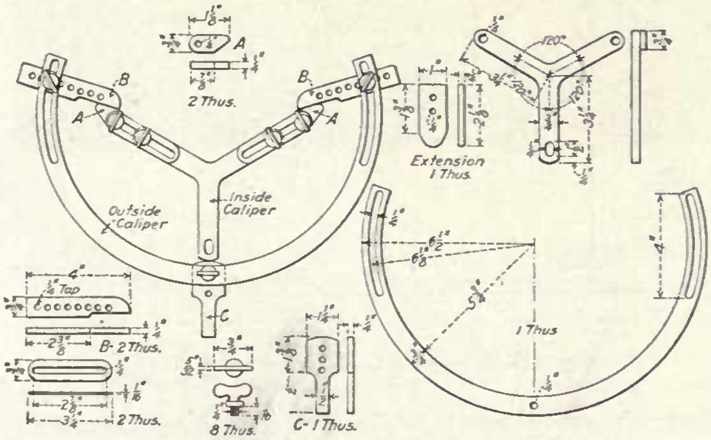



**Fig. 64—Caliper for Driving Boxes and Brasses.**

put in the shaper and the ends are planed off as close to a fit as possible. The job is then finished with a file and this takes considerable time if the work comes up again and again in a large shop. The accompanying sketch, Fig. 64, gives a clear idea of a caliper used in a large western railway shop with excellent results. The inside caliper is used for getting the inside measurement of the driving-box at its smallest point, which is usually near the center. The outside caliper is then set to the inside caliper, allowing a certain amount for a press fit, depending of course on the size and material in the box and on the pressure required. The brass is placed on a slotter and slotted off to the diameter of the box, after which the outside caliper is used to lay off the amount to be taken off the ends. After being slotted to the caliper, the brass is ready to be pressed into the box, with no filing or fitting. A slotter-hand working on this class of work can fit from ten to fifteen brasses per day.—*F. A. Dailey, Northern Pacific, St. Paul, Minn.*

### DRIVING BOX BRASS GAGE.

The usual way of laying off bearings for driving boxes, preparatory to slotting or turning them for the box fit, is to place the brass on the box in the position which it will assume for pressing into place and then

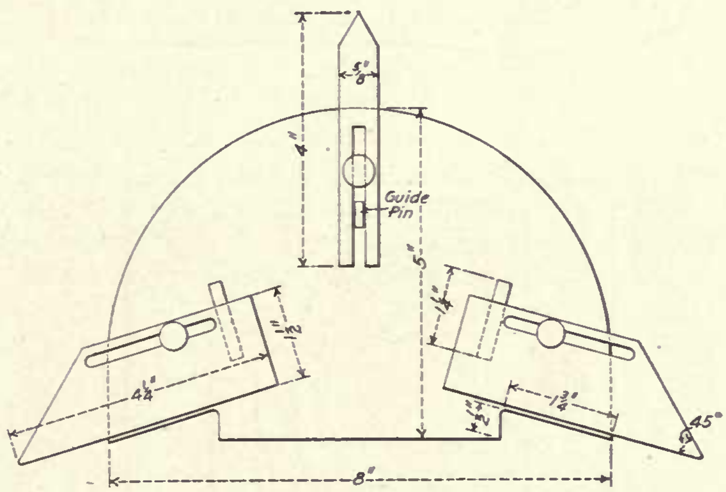



**Fig. 65—Driving Box Bearing Gage.**

scribe off on the edge of the brass the line of fit. This method is generally satisfactory, but it is almost impossible to press the brass into the box without using a file to get the proper angle at the retaining shoulder. The gage shown in Fig. 65 is really an inside caliper with three legs and is designed for laying off the proper angle at the ends of the brass. The three legs are adjustable to the requirements of any brass for from 6-in. to 10-in. journals. The central adjustable leg always moves along a radial line, being guided by a fixed pin, while the other two legs are free to be adjusted to obtain the proper angle. The plate is made of sheet iron about 3/16 in. thick. All driving box brasses at these shops are turned on a lathe for the circular fit, using a specially designed mandrel. Brasses are much more easily turned to size on a lathe than machined on a slotter, since it is impossible for the mechanic to caliper the finished sizes of the brass on a slotter until an entire cut has been made, while in the case of a lathe, it is only necessary to make one or two revolutions in order to caliper it.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### DRIVING BOX BRASS, SLOTTING.

The output of driving box brasses on the slotter was greatly increased by the use of the device shown in Fig. 66. The brass is held by a jig, the idea being to have everything perfectly rigid and then to use a stiff tool in a rigid tool post. After the first brass is finished

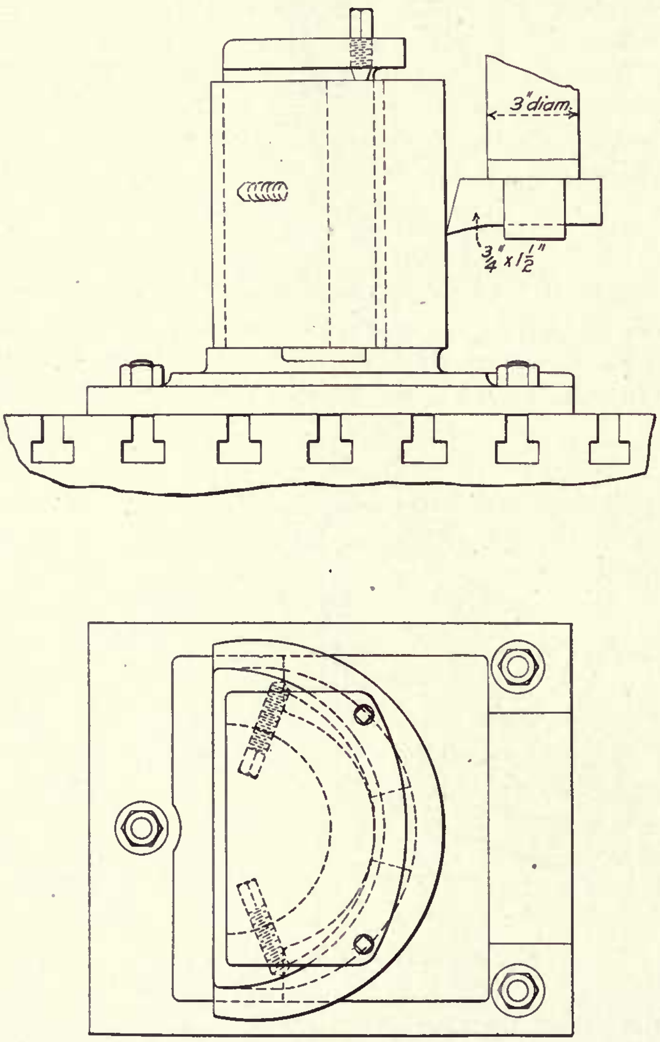



Fig. 66—Slotting Driving Box Brasses.

the tool is not disturbed, for it is preferable to cut as many brasses as possible without grinding it. The gaging is done by calipering one driving box and then, if it is necessary, moving the table in or out to suit the next size.—*Frank Rattek, Brighton, Mass.*

### DRIVING BOX BRASS, SLOTTING.

A useful angle plate used in connection with slotting the ends of driving box brasses is shown in Fig. 67. The V of the angle plate insures the brass being machined square with the turned crown. The brass is held rigidly to the angle plate by a clamp and two bolts which pass through the ¾-in. holes. After the ends are slotted the brass is pressed into the box under a pressure of 8 to 10 tons; the brass is then slotted or bored for the journal fit. The device is simple in design and easily made.—

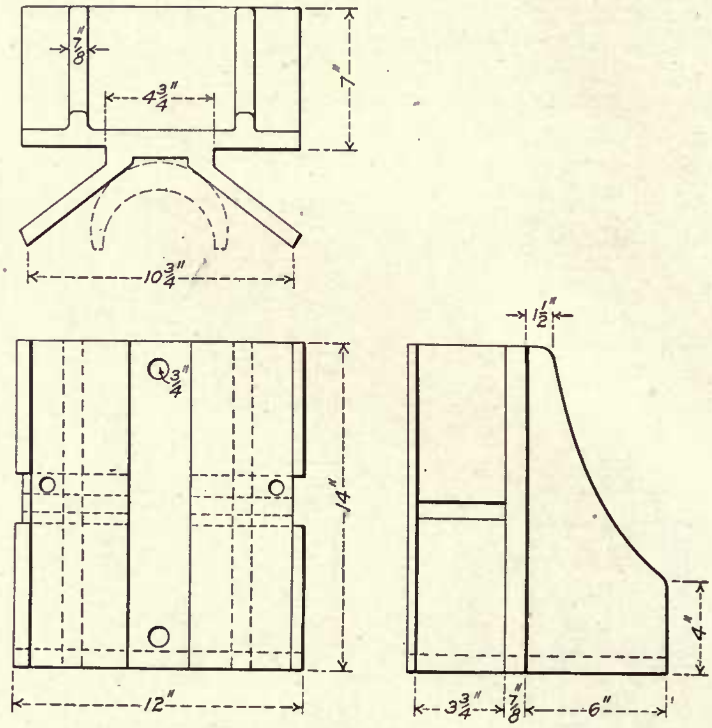



Fig. 67—Driving Box Brass Angle Plate.

*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

### DRIVING BOX CELLAR BORING TOOL.

A tool for boring oil cellars and grease lubricators is shown in Fig. 68. It was devised to do the work formerly handled by a single tool boring bar used on a horizontal mill. The head carries four independent tools made of 1-in. square steel, which are held rigidly in place by set screws and are easily adjusted. The practice is to have the cellar fit within 1/16 to ⅛ in. of the journal to prevent unnecessary waste of grease and oil. As the

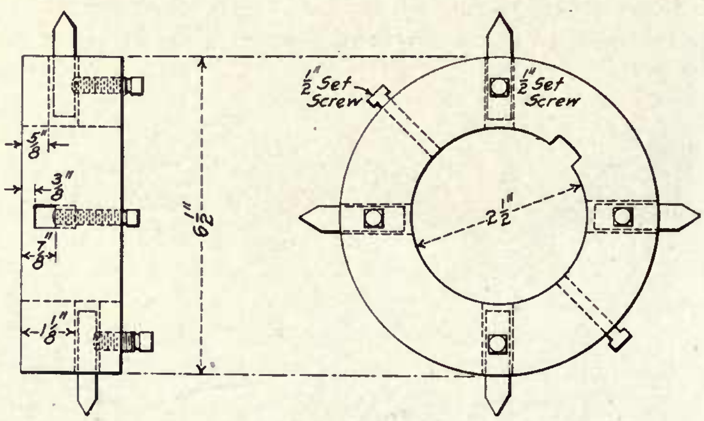



Fig. 68—Driving Box Cellar Boring Tool.

journals are allowed ½ in. limit of wear it may require a cut of ⅛ in. or more to bore the cellar to fit a new axle. The four cutters are adjusted to different lengths in order that each may do its proportionate share of the cutting. This tool is of simple design, yet it has increased the output to 25 cellars per day and decreased the cost of this work about 20 per cent.—*John V. Le Compte, Assistant Foreman, Baltimore & Ohio, Garrett, Ind.*

### DRIVING BOX, CHUCK FOR BORING.

One of a set of two chucks used on a boring mill for facing off cast brass hub liners of driving boxes is shown in Fig. 69, while the photograph, Fig. 70, shows a pair of these chucks in use. They are fastened to the machine bed by bolts that have T-heads which fit in the slots.

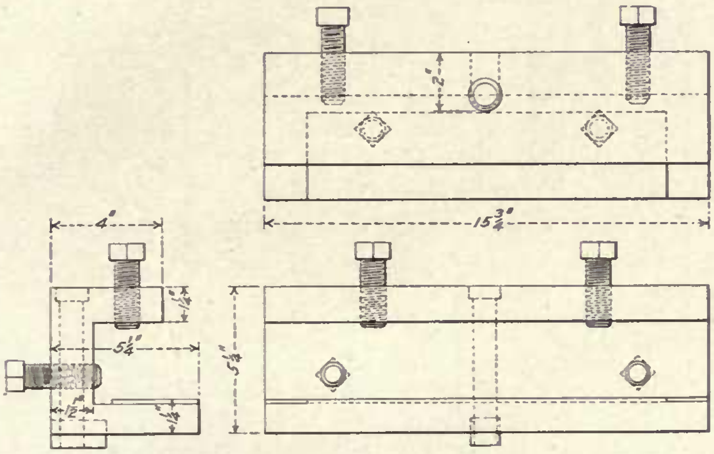


**Fig. 69—Details of Driving Box Chuck.**

There is a 1-in. x 1-in. wrought iron piece set in the bottom of the chuck, which meshes with the table slot and prevents rotation of the chuck. The chucks are placed on the bed of the machine so that a box will slip into position easily, after which the set screws are tightened against the flanges. When the box is to be removed, the set screws are loosened on but one side. These chucks will take all designs of boxes used on the road and are made of wrought iron, planed from the solid. A box is usually handled, floor to floor, in 15 minutes.—*Long Island Railroad, Morris Park, N. Y.*

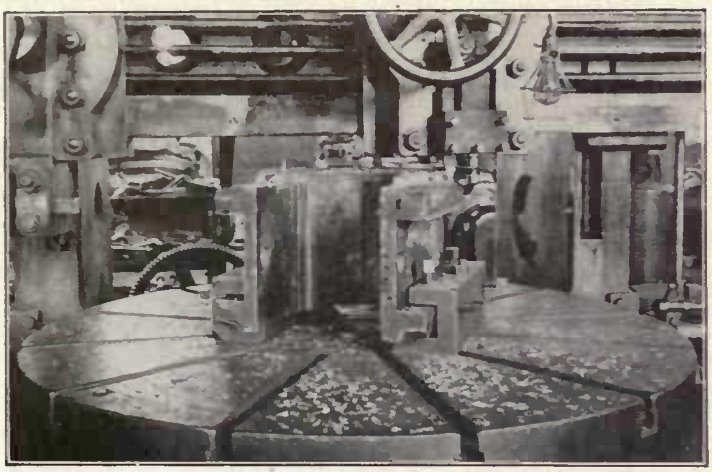


**Fig. 70—Driving Box Chucks on Boring Mill.**

### DRIVING BOX, CHUCK FOR BORING.

Driving boxes are bored on a boring machine and are held in a simple chuck, Fig. 71, with a short projection that fits the center hole of the table. The box rests on the parallel pieces *A* and is adjusted centrally by set-

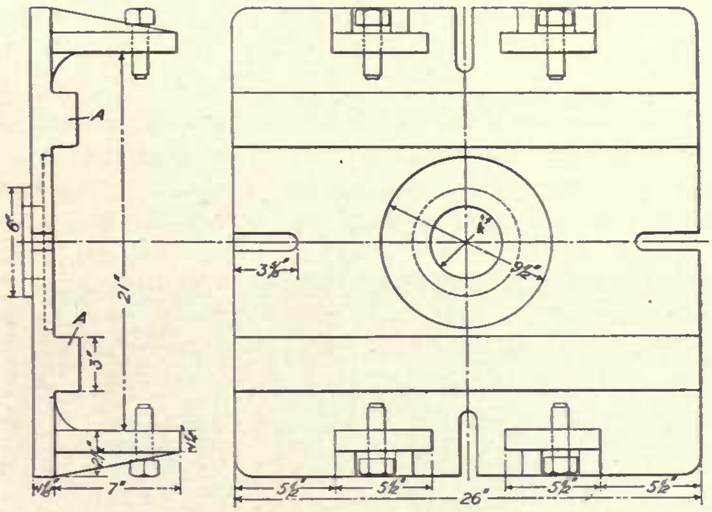


**Fig. 71—Chuck for Boring Driving Boxes.**

screws in the vertical flanges at the sides. It is clamped down in the usual manner.—*Delaware, Lackawanna & Western, Scranton, Pa.*

### DRIVING BOX OIL GROOVES.

The usual method of chipping oil grooves in driving box shoe and wedge faces with a pneumatic hammer takes considerable time and makes unsatisfactory grooves. By the method illustrated much better grooves are made in a shorter time. The tool shown in Fig. 72 is applied to a drill press and is made so that a small drill may be placed in the pocket in the center of the

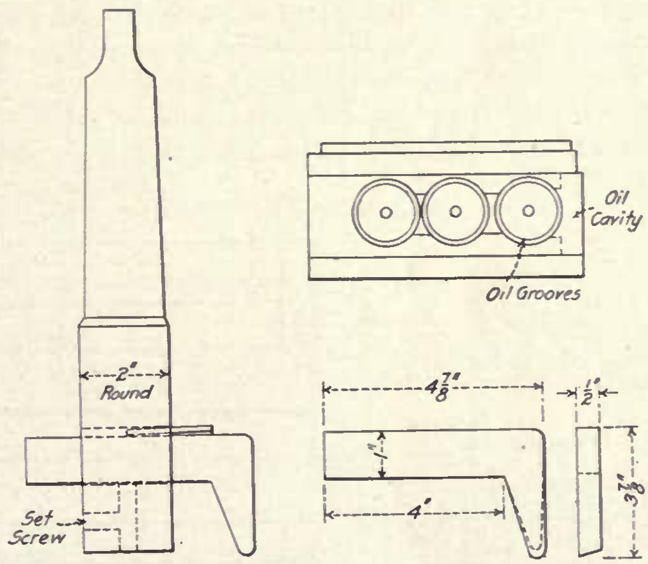



**Fig. 72—Tool for Making Oil Grooves in Driving Box Shoe and Wedge Faces.**

bar and be adjusted to project the proper distance. It is clamped in this position by a set screw. This drills a hole and holds the bar rigidly in place, while the grooving tool, after being adjusted to the desired radius and clamped in place by the taper key, makes the oil groove. Grooves may be made thus in 40 per cent. less time than if the center hole and groove were made in two operations, and in 75 per cent. less time than required for chipping with a pneumatic hammer.—*John V. Le Compte, Assistant Foreman, Baltimore & Ohio, Garrett, Ind.*

### DRIVING BOXES, BORING AND FITTING.

All driving boxes are fitted to mandrels, instead of boring them and sending them to the erecting side to be fitted to the journals. These mandrels are hollow cast-iron cylinders, ranging from 7 9/64 in. to 9½ in. in diameter, increasing by sixty-fourths. They are stored in a rack beside the boring mill and one man gives all of his time to boring and fitting driving boxes. The Great Northern uses grease for its driving journals, and the grease grooves, which are ⅜ in. x ⅜ in., are cut in the brasses by this man with an air hammer.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

### DRIVING BOXES, PLANING.

The beam shown in Fig. 73 is used on the double head planer for planing driving boxes. It is a casting 4 ft. long, 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 set properly on the bed of the planer it is merely necessary to bolt the boxes against the face to insure accurate alinement for planing.—*Delaware, Lackawanna & Western, Scranton, Pa.*

### ECCENTRIC CHUCK.

A steel eccentric chuck for turning four different throw eccentrics by simply changing the position of the eccentric plate on the chuck plate is shown in Fig. 74. The pockets are counter-bored in the chuck plate and located so as to give the desired throws, and each pocket is stamped the size of throw which it represents. The top side of the eccentric plate is made the size of the driving axle fit for the eccentric, while on the bottom side is a boss to fit the pocket in the chuck plate. When applying, the eccentric is placed in the pocket in the chuck plate and clamped, as shown in the sectional drawing. This chuck can be placed on either a boring mill or lathe and will stand a heavy cut or feed. Eccentrics can be applied or removed rapidly and with little labor. The chuck will not only increase the output of the ma-

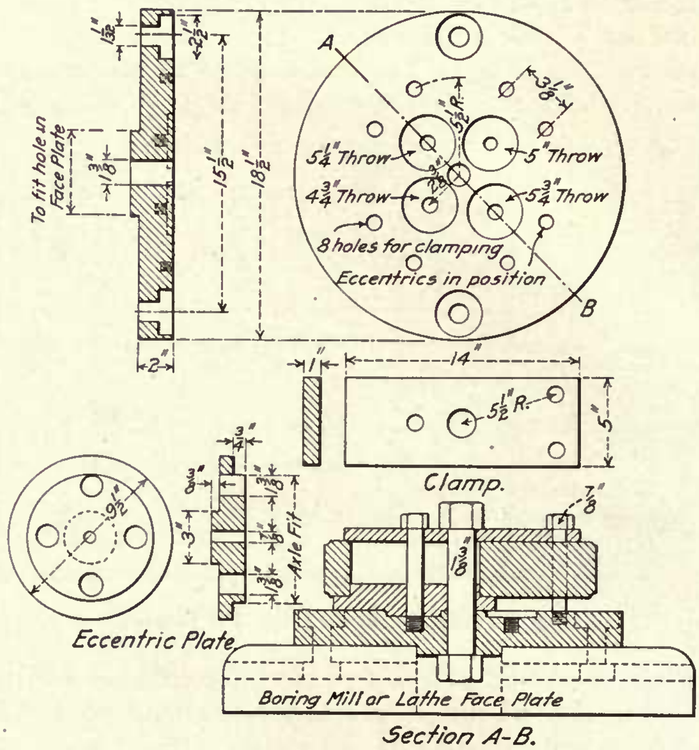



Fig. 74—Eccentric Chuck.

chine on this class of work but will insure a correct throw to every eccentric turned.—*E. G. Gross, Master Mechanic, Central of Georgia, Columbus, Ga.*

### ECCENTRIC CHUCK.

A cast iron chuck for boring and facing eccentrics is shown in Fig. 75. Provision is made for 5-in., 5¼-in.

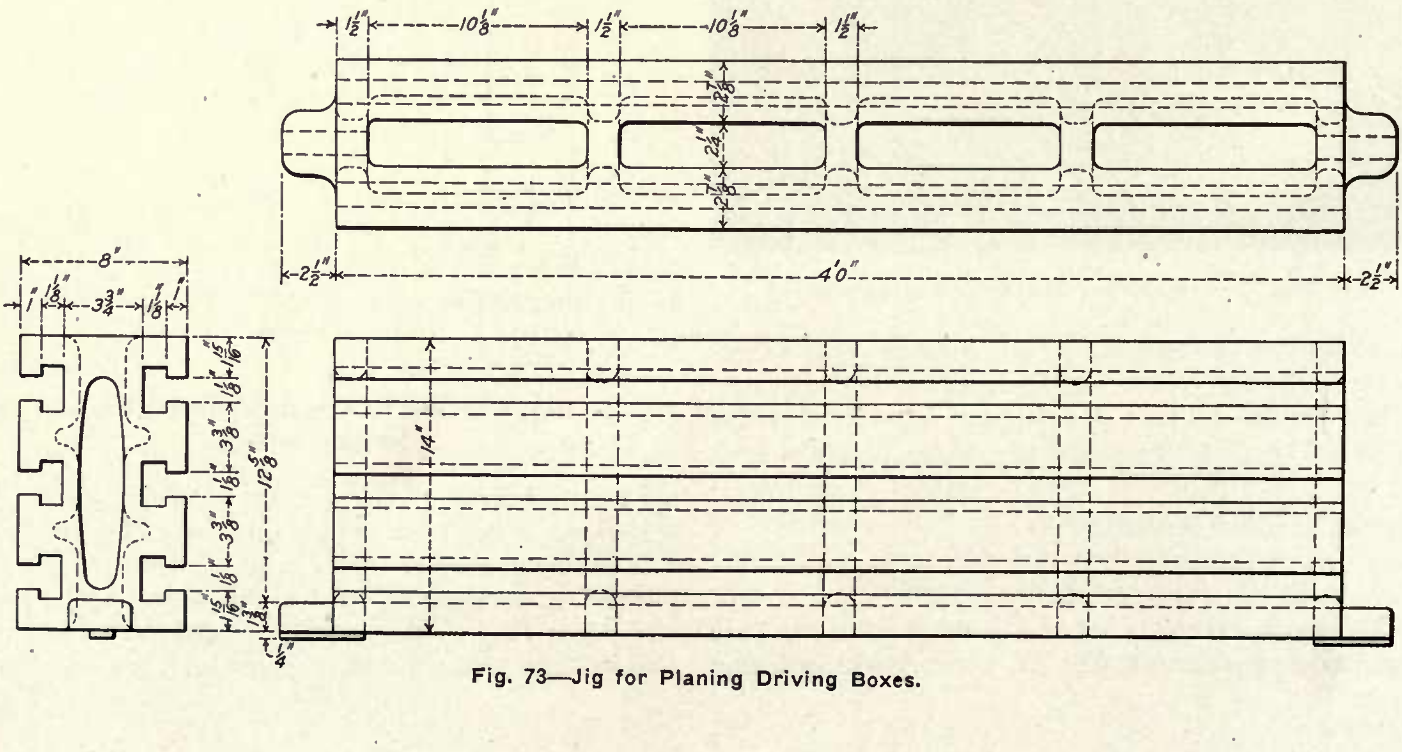



Fig. 73—Jig for Planing Driving Boxes.

and 5½-in. throw eccentrics. When boring out eccentrics that have been turned on the outside, circular filler

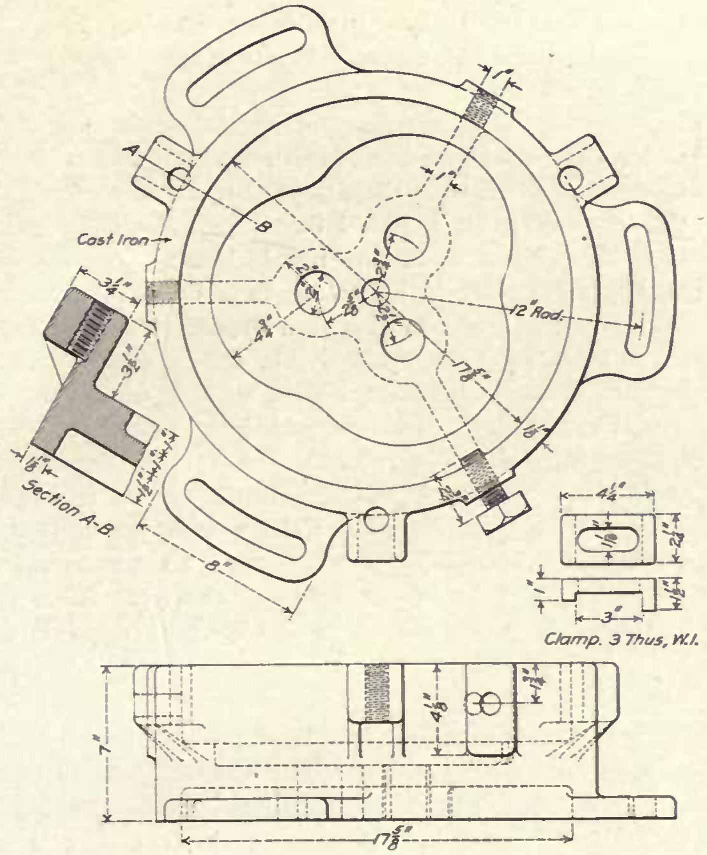



Fig. 75—Eccentric Chuck.

pieces are used inside the chuck. When facing, the casting is held by the three 1-in. set screws, and when boring by three forged top clamps, fastened by 1-in. tap bolts. About 1½ hours' time is required for boring the axle fit and facing both sides of a rough casting. For an old eccentric about 30 minutes' time is required for reboring.—*Long Island Railroad, Morris Park, N. Y.*

### ECCENTRIC DRILLING JIG.

The details and general appearance of a jig for drilling the bolt holes in the halves of split eccentrics are shown in Figs. 76 and 77. The jig is placed on a drill

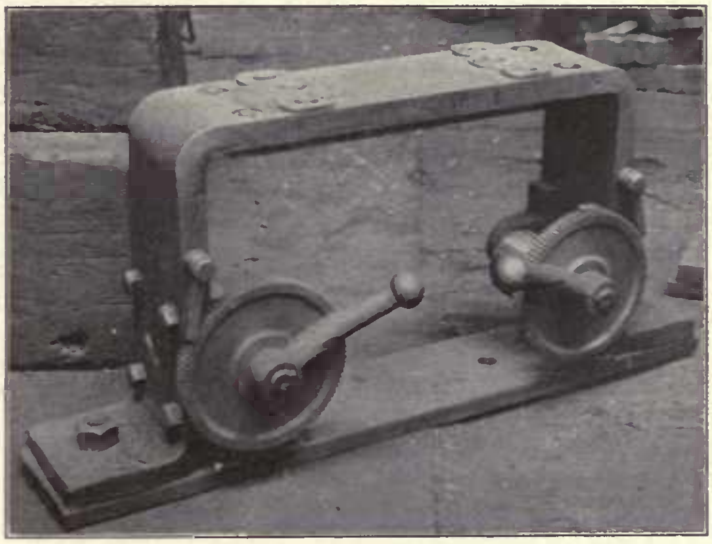


Fig. 77—Eccentric Drilling Jig.

press table in the position shown. The half-eccentric is placed on the cams, planed face upward. The levers are

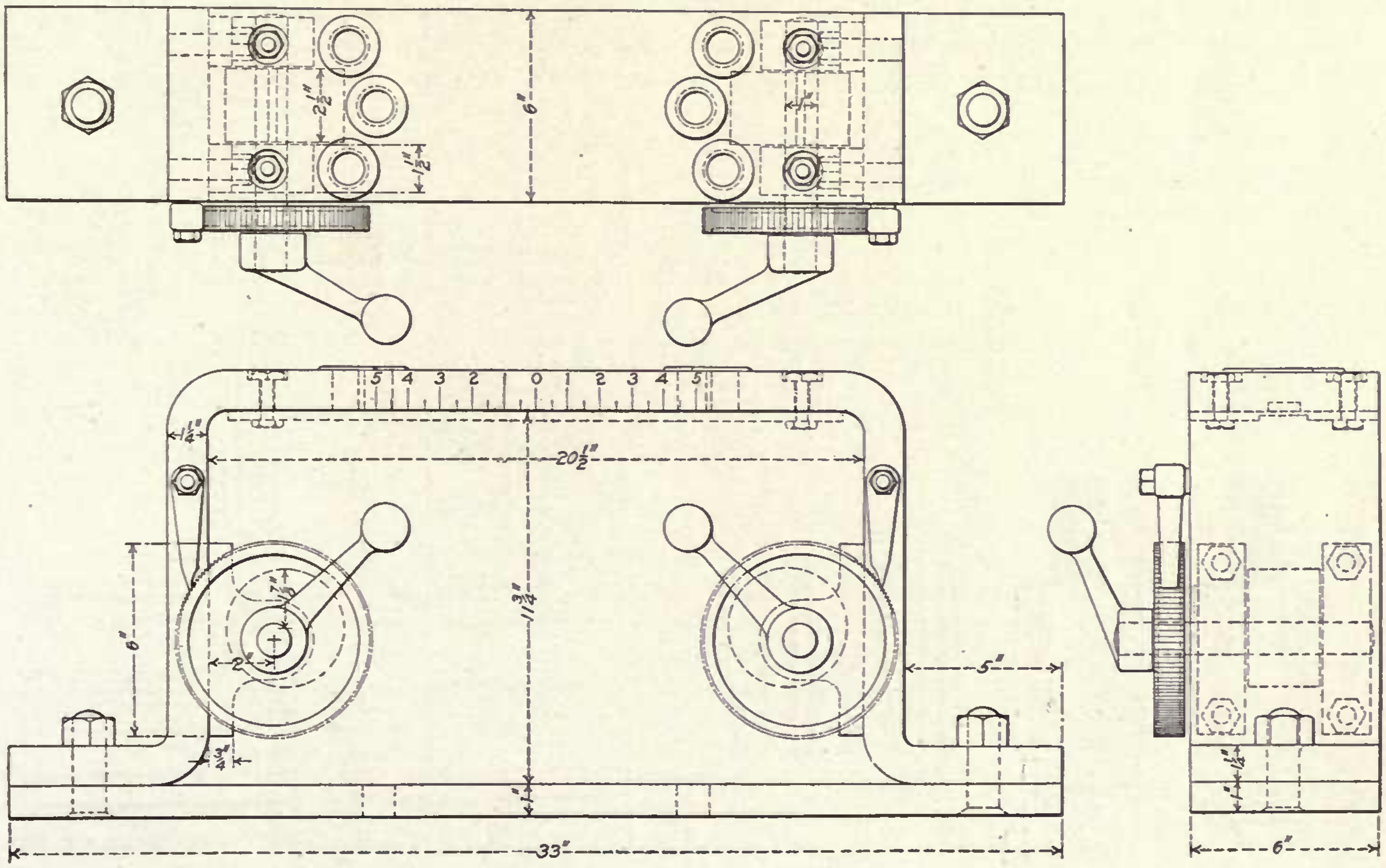



Fig. 76—Details of Eccentric Drilling Jig.

then raised until the planed surface is in contact all along the under side of the top bar of the jig. The latch dogs provide for locking the cams in position. The half-eccentric is centered by the graduations shown on the drawing, and the drill is fed down through one of the bushings in the top bar of the jig, no laying off of holes being necessary. It will be noticed that the plate bolted to the under side of the top bar has a wider groove than does the under side of the bar itself, which provision is necessary to provide for different style eccentrics.—*Central Railroad of New Jersey, Elizabethport, N. J.*

### ECCENTRIC MANDREL.

A rigid mandrel with an adjustable throw, for use in turning eccentrics on a boring mill, is shown in Fig. 78.

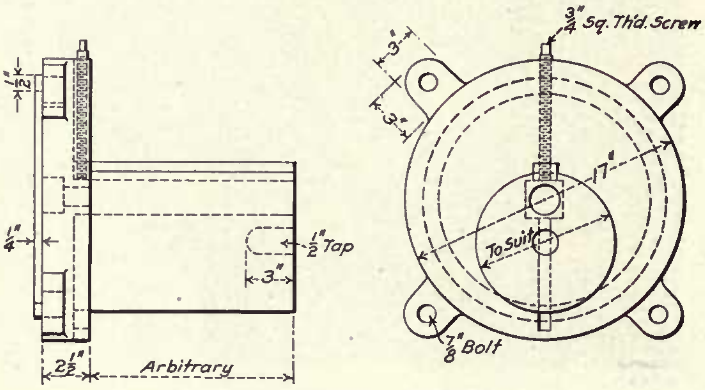



**Fig. 78—Eccentric Mandrel**

The shaft of the mandrel being solid is adapted only for eccentrics of a given bore. The eccentric is placed on the shaft and is held from turning by the key. The lug on the bottom of the mandrel slides in a slot in the base, thus providing for the adjustment of the eccentricity by means of the adjusting screw. The base may be graduated to facilitate adjustment to any desired throw. The table of the boring mill is grooved to accommodate the annular boss on the base plate of the mandrel, which is clamped to the bed through the four lugs. After two or three eccentrics are applied to the mandrel, depending on their thickness and the height of the mandrel, which latter may be made to suit any conditions, a heavy washer is placed over the top eccentric and clamped to the mandrel by a 1¼-in. bolt. The following results have been obtained with this mandrel on a 42-in. Gisholt boring mill, using both heads. In a day of 10 hours, 18 eccentrics, 17 in. in diameter, 4½-in. face, with 2½-in. boss, making the width 7 in., were finished. Two eccentrics were applied at a time, making nine separate operations. This method increased the output for this size eccentric by 45 per cent. On another day of 10 hours, 22 eccentrics, 14⅝ in. in diameter, 4-in. face, and without a boss, were turned. Three eccentrics were applied at a time. This method increased the output for this size eccentric 54 per cent.—*John V. Le Compte. Assistant Foreman, Baltimore & Ohio, Garrett, Ind.*

### ECCENTRIC MANDREL.

An eccentric mandrel for a lathe is shown in Figs. 79 and 80. It consists of a cast iron slotted base, which is bolted to the face plate of the lathe. The bar on which the eccentric fits is held in place on the base by a large nut. This bar may be adjusted for different throws of eccentrics by the long screw which passes through the base. As shown in the photograph, the bar has four slots in which tapered wedges fit. These are grooved near the outer ends to engage the collar of the large nut, the turning of which adjusts the wedges for the different sizes of axle fits. There is an adjustable dog on the

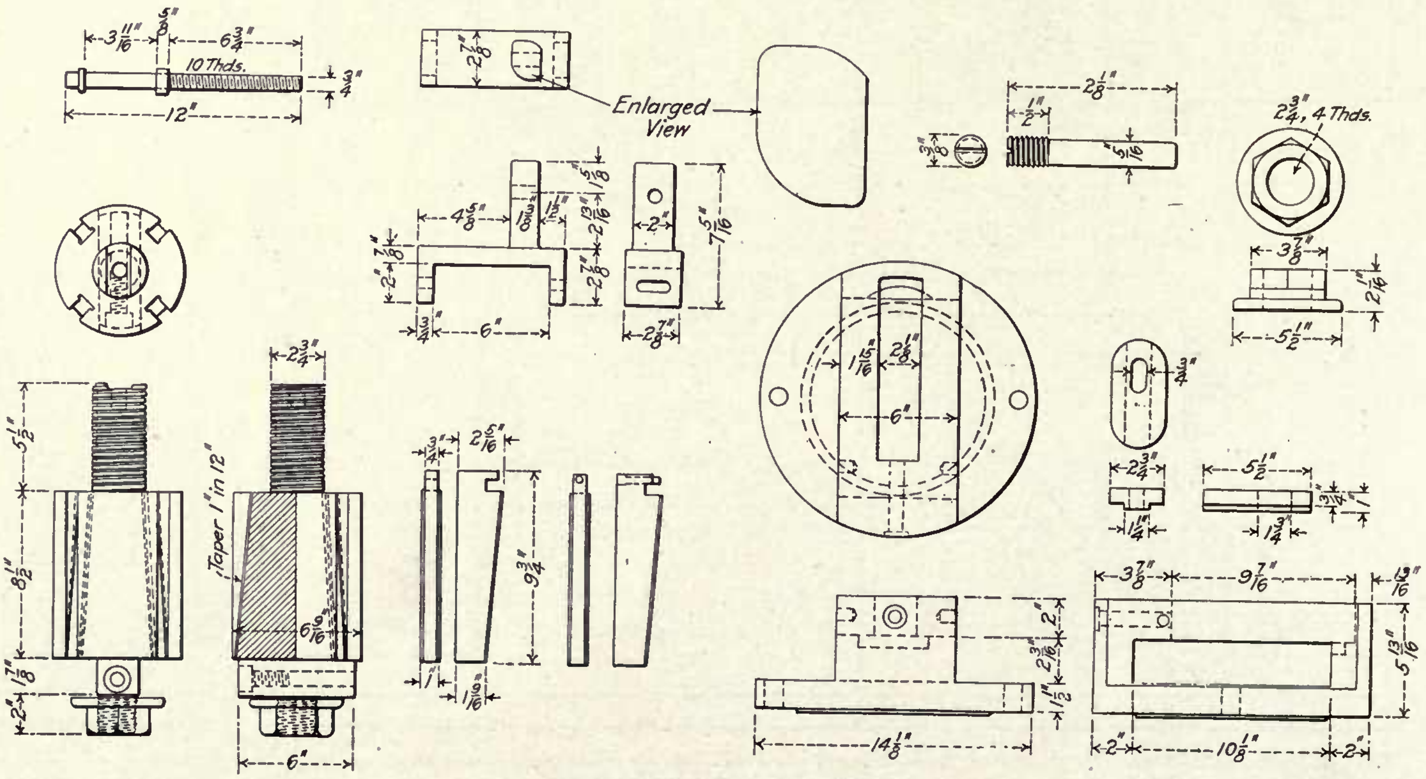



**Fig. 79—Details of Eccentric Mandrel.**

base of the mandrel which engages the inside fillet on the center rib of the large half of the eccentric and holds it rigidly in place. Different sets of wedges to cover a

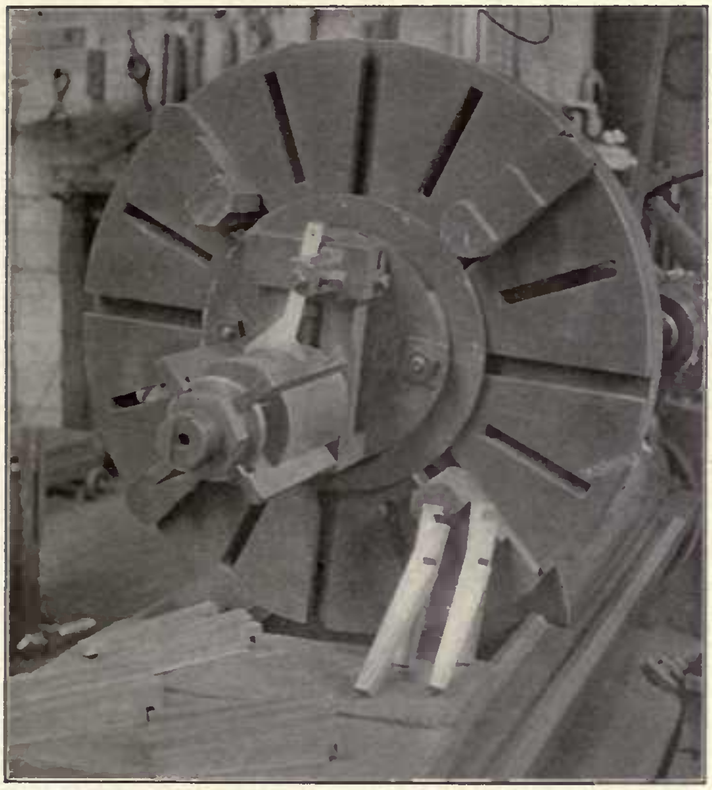


Fig. 80—Eccentric Mandrel.

wide range of axle fits are shown in the photograph. A gage for measuring the different eccentric throws is also shown resting on the mandrel.—*P. F. Smith, Chief Draftsman; Thos. Marshall, Master Mechanic; Henry Holder, General Foreman, and James Findlay, Machine Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

### ECCENTRIC MANDREL.

The eccentric mandrel, Fig. 81, consists of a flat plate held in place on the boring mill by lugs which fit in the

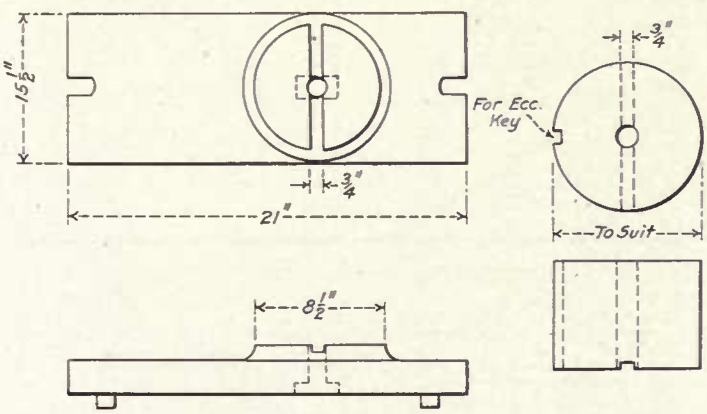



Fig. 81—Eccentric Mandrel.

slots of the table. A boss is turned on it, as shown, to finish the eccentric at one chucking. The chuck is held securely in position by a bolt which passes through the center of the boss, and is prevented from turning by a key. The eccentric is slipped on the chuck and is held by set screws and the key.—*L. M. Granger, Assistant General Foreman, and John Todd, Machinist Foreman, Erie Railroad, Galion, Ohio.*

### ECCENTRIC MANDREL.

The mandrel for turning eccentrics shown in Fig. 82 consists of a disk 21 in. in diameter and 2¼ in. thick, with a taper mandrel projecting on one side, with its

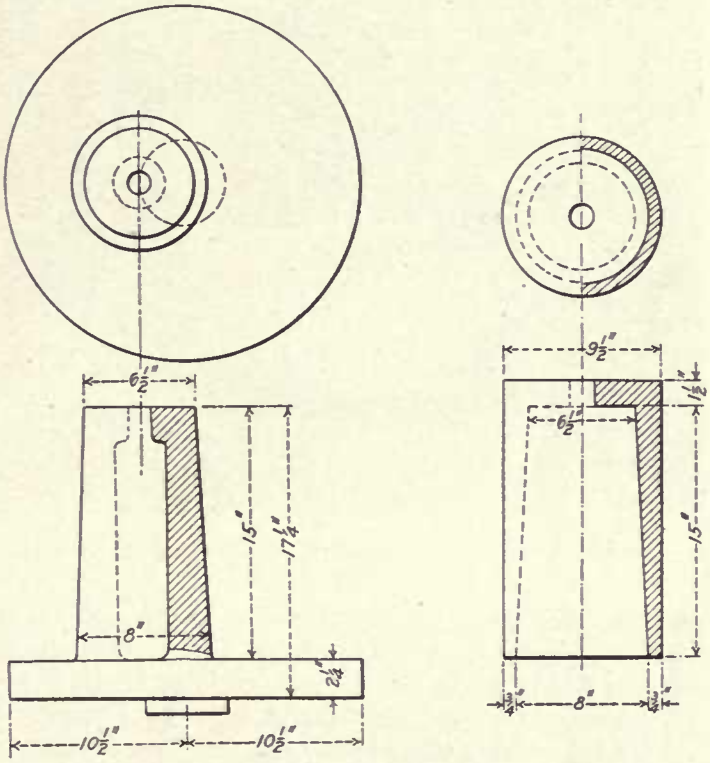



Fig. 82—Mandrel for Turning Eccentrics.

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 the bore of the eccentric to be turned is slipped over the mandrel. The disk is bolted to the faceplate and the eccentric is slipped 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 that all surfaces will be in proper relationship.—*Delaware, Lackawanna & Western, Scranton, Pa.*

### ECCENTRIC MANDREL.

A 52-in. Bullard vertical boring mill and an eccentric clamped in position for turning are shown in Fig. 83. The drawing, Fig. 84, shows the chucking plate and clamping sectors in detail. New eccentrics are first bored to minimum axle fit diameters and are then placed on the chucking mandrel for turning, using two tools, one for roughing, and the other for finishing. The chucking mandrel consists of a base plate made of soft steel, and four cast iron sectors that are expanded by a conical wedge. The base plate has a lug that fits in the slot on the table. There are several ⅞-in. holes shown near one end of the base plate to provide for 4-in., 4½-in. and 5-in.

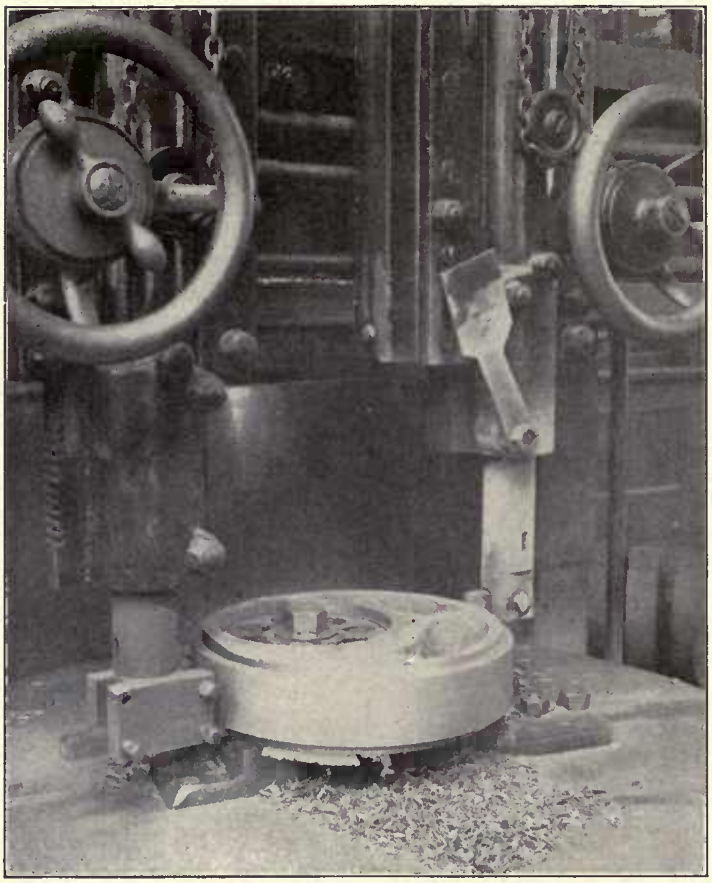


Fig. 83—Application of Mandrel for Turning Eccentrics.

throws, by moving the base plate along the slot. Several holes have been drilled in the bed of the mill to correspond to the throw holes in the base plate, and a plug is used to locate the base plate. The eccentric is fastened to the base plate by the expanding bushing, the four sectors and the conical wedge. It is held from turning by a plug that is driven in the base plate so that the rib will fall central, thus holding it rigidly in place.—*Lehigh Valley, Sayre, Pa.*

ECCENTRIC MANDREL.

The details of a mandrel for turning eccentrics before the key-way is cut are shown in Fig. 85. A faceplate, fitted to the lathe doing the eccentric work, is counterbored about ½ in. deep, the size of the outside of casting *A*. This casting is fitted and held in the counterbore by the bolt *B*. The head of this bolt is slotted and pro-

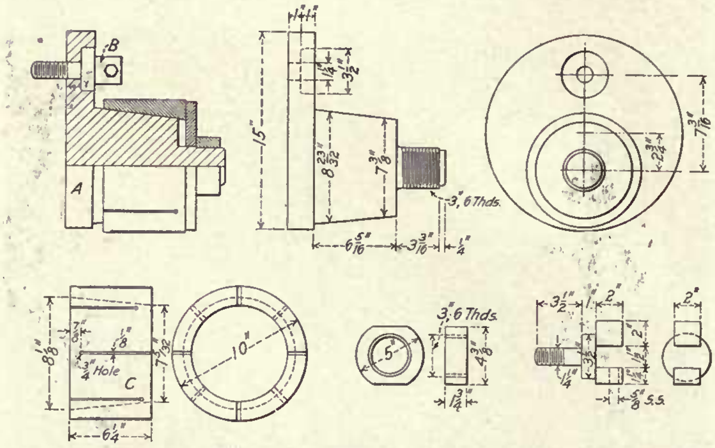



Fig. 85—Mandrel for Turning Eccentrics.

jects from the back of casting *A*. One side of the slotted head is fitted with a ⅝-in. set screw. A lug on the casting *A* is turned to a taper for 6 5/16-in. of its length, and the outer end is threaded and fitted with a nut and washer. An expanding sleeve *C*, the inside bore of which is the same taper as the lug on casting *A*, is pressed part way on the lug and is held in place by the above-mentioned nut and washer. The eccentric (after being bored) is placed on the mandrel and the rib is caught in the slotted bolt and clamped by the set screw. The nut on the end of the lug is drawn tight, thus expanding the sleeve *C* and holding the eccentric rigidly. The expanding sleeve will make up for any variations in the eccentric bore.—*F. A. Dailey, Northern Pacific, St. Paul, Minn.*

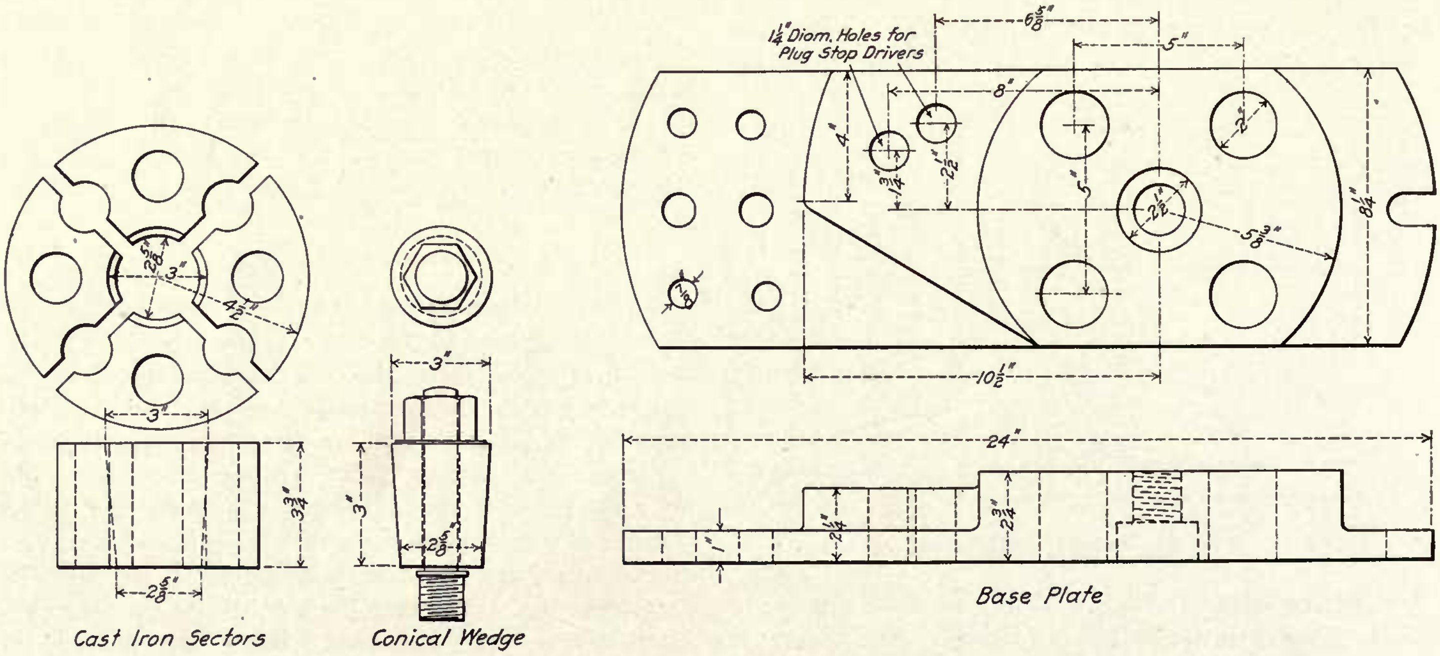



Fig. 84—Mandrel for Turning Eccentrics on Boring Mill.

### ECCENTRIC MANDREL.

The device for turning eccentrics, Fig. 86, combines an adjustability to care for a wide range of eccentric throws, quick setting of the work and rigidity while in operation. The base *A* is bolted to the faceplate and carries a way, or bearing, *B,* which extends across *A.* This way, Fig. 87, is really U-shaped, with the two legs cast solid with the main body. The open portion serves as a space for the tightening nut *C,* of the expanding mandrel. The end of the mandrel is put in through a rectangular hole in the face of the way, and is held set in any desired position of eccentricity by the nut *C.* The mandrel is provided with the expanding jaws *D D,* which move to and fro in the grooved guides in the usual manner, and are held out to the work by the nut *E.* With the eccentric set over the mandrel and held in this way

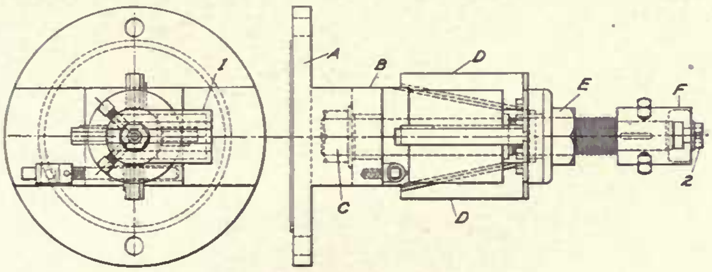



Fig. 86—Eccentric Mandrel.

there is considerable overhang, and on heavy work there would be apt to be a good deal of chatter. To obviate this and hold the work steady, a collar *F,* is slipped on over the end of the mandrel stem. This collar has a side projection or overhang extending out on one side in which there is an undercut way (Fig. 87). This overhang and its way are held in line with the main way *B* of the base by a key, and carries a small slide *2* which may be clamped in any position by a nut. By setting *2* with the same offset, but in the opposite direction from the mandrel, it offers a center bearing for the tailstock, so that the latter can be brought up against the work, and the mandrel can thus be securely supported.

In turning the eccentric the work is done just as though it were held on a solid mandrel carried at its ends by the head and tailstocks. For setting or removing the work it is simply necessary to drive out the key holding the collar *F* in place, back off the tailstock and slip the eccentric over the end of the mandrel. Another eccentric can then be put in place and clamped by setting

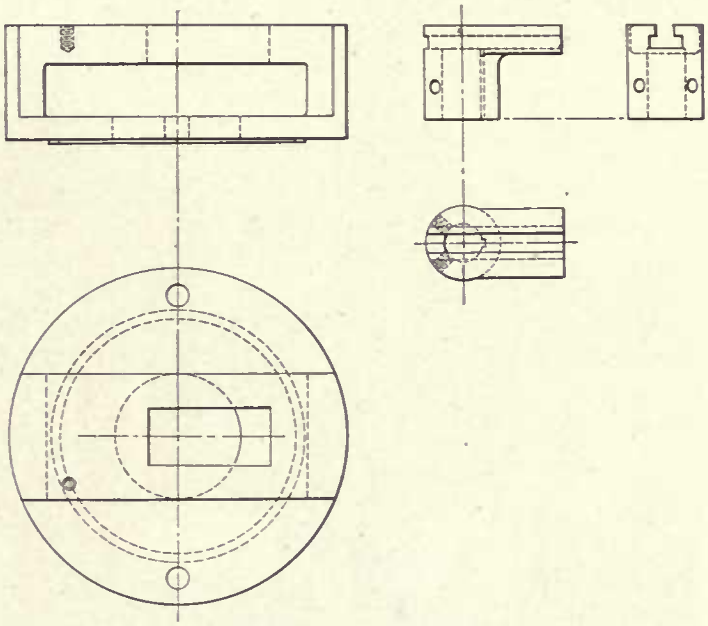


Fig. 87—Details of Way of Eccentric Mandrel.

up the nut *E* and keying on the collar *F.* With the device shown eccentrics with throws ranging from 0 to 6 in. can be turned, and the adjustment from one to the other is easily and quickly made.

### ECCENTRIC STRAP CHUCK.

A chucking arrangement for machining cast steel eccentric straps on a boring mill is shown in Figs. 88 and 89. The Long Island use a flangeless eccentric strap with an I-shape brass bearing liner. This liner is double-flanged, one side gripping the strap and the other overlapping the eccentric. The flanges on the strap side of the liner do not clamp it tightly, but just enough to hold it while handling. The ½-in. thick strap liners between the two halves extend beyond the cast-steel portion of the straps and hold the brass bearing liners from turning. The two holding pieces of the chucks, to which the halves of the strap are bolted through the 1⅛-in. holes, are made ½-in. thick to correspond to the standard liner used. The strap is held above the bed of the machine to permit facing off the under side without resetting. The driving clamp is fastened to the bed of the

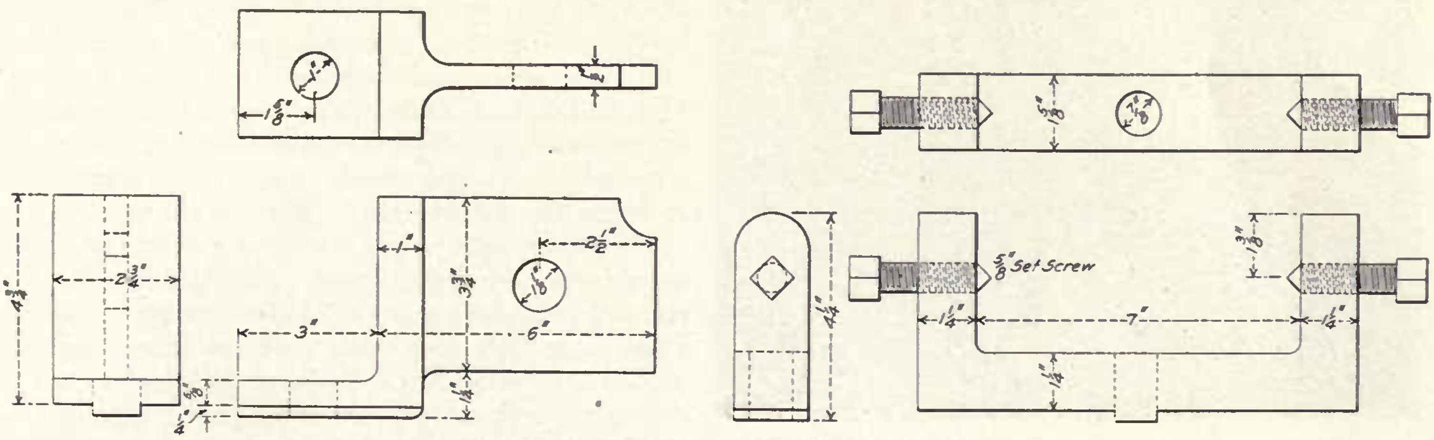



Fig. 88—Details of Eccentric Strap Chuck.

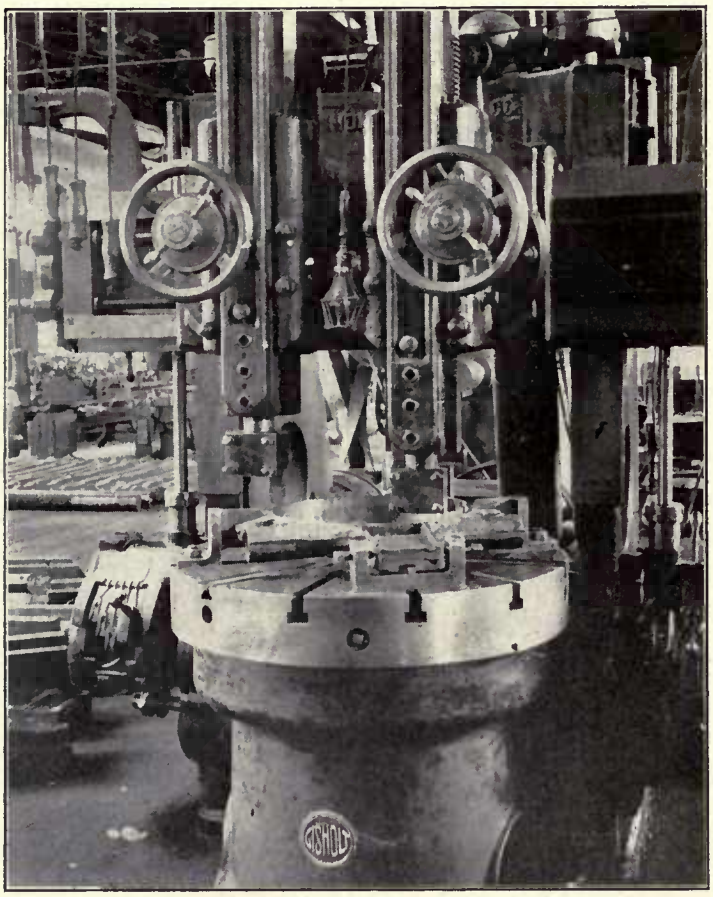



Fig. 89—Eccentric Strap Chuck as Used on Boring Mill.

machine, as are the holding pieces, and grips the blade end of the strap by the two set screws. All three pieces may be made of either wrought iron or soft steel. Straps are handled, floor-to-floor, with these chucks, including boring and facing to snap gages, in about one hour per strap.—*Long Island Railroad, Morris Park, N. Y.*

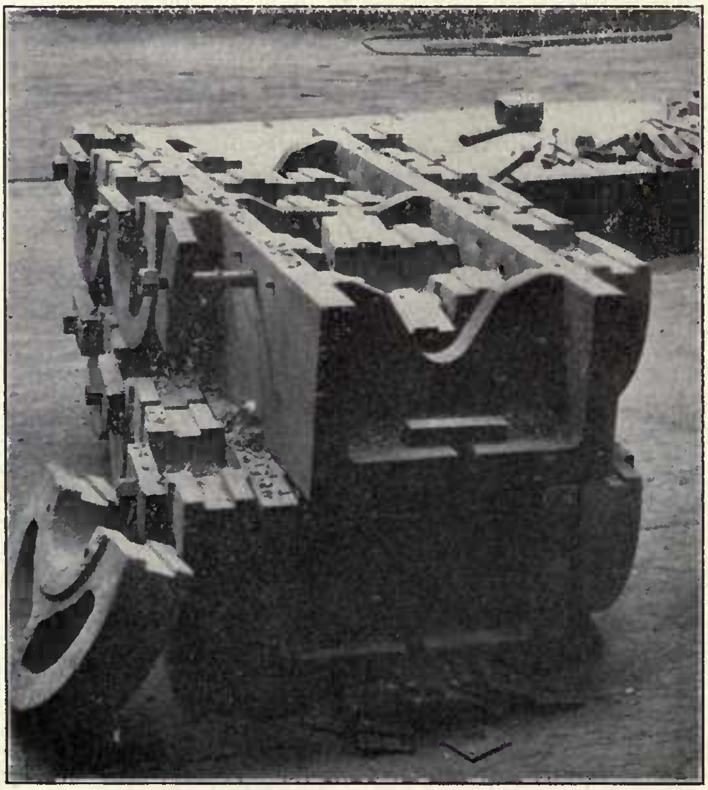


Fig. 90—Jigs for Planing and Drilling Eccentrics.

ECCENTRICS, PLANING AND DRILLING.

Owing to the shape of eccentrics, it is necessary to use jigs to secure rapid production in planing and drilling them. In the photograph, Fig. 90, are shown two box-section plates used for this purpose. The half-eccentrics are first drilled to a template to fit the ⅜-in. plugs, two of which may be seen on the side of the upper plate in the photograph. The halves are then clamped to the plates, fitting over these ⅜-in. plugs. Each faceplate will accommodate six halves, and two such plates are put end to end on a planer at one time. After the planing is completed the plates or jigs, with the eccentric halves still clamped to them, are taken to the drill press for drilling the large bolt holes.—*Lehigh Valley, Sayre, Pa.*

GAGES, STANDARD.

Among the minor gages in use in the shop, on which much depends, are the four shown in the accompanying photograph, Fig. 91.

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

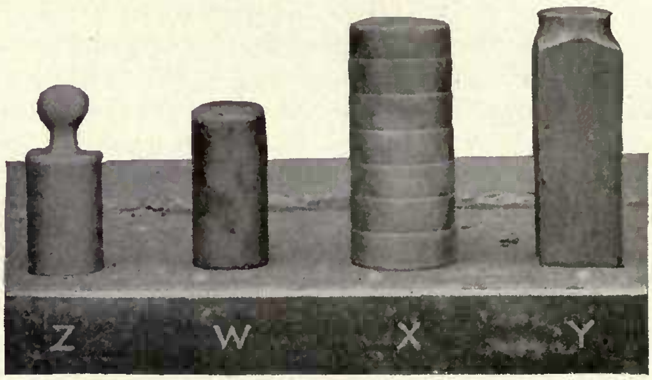



Fig. 91—Minor Gages.

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

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

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

The fourth, *W*, is more of a shop tool or kink. It is quite common for valve rods to be so abused in their removal from the valve rod sockets that the centers are either destroyed, or so mutilated that they cannot be used. This block, *W*, is bored to fit over the tapered end of the rod, and at its end has a good center that can be used in the lathe when it becomes necessary to turn the stem.—*Delaware, Lackawanna & Western, Scranton, Pa.*

GOOSE-NECKS, MACHINING.

The bracket shown attached to the faceplate of a lathe in the accompanying sketch, Fig. 92, is a jig for facing, or drilling and tapping holes in a goose-neck. The tongue at the back of the jig fits in a slot in the faceplate, and the semi-circular groove in the jig, in which the goose-neck rests, is bored in line with the tongue, which makes the jig easy to adjust and set up. The goose-neck is strapped down into this groove. The output may be tripled with this device, which may readily be adjusted and handled by an apprentice, if necessary. —*Samuel Magill, Apprentice Instructor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

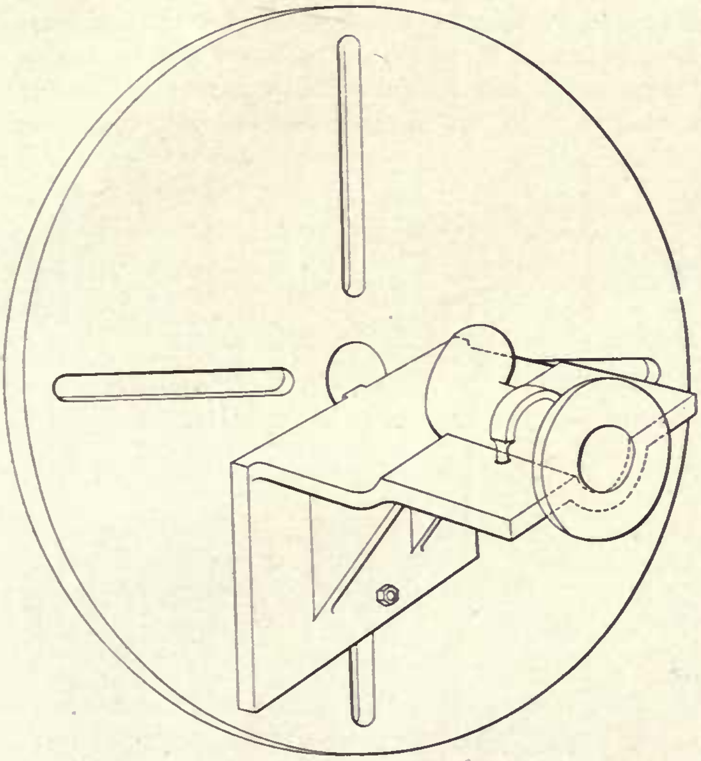


Fig. 92—Jig for Machining Goose-Necks.

GRATE BEARER CROSS-TIE, MACHINING.

Two positions of a grate bearer cross-tie on a double head slotting machine are shown in the accompanying photographs, Figs. 93 and 94. The first one shows the cross-tie in position for machining the frame fit. There are two parallel blocks used for this work. The lower one is clamped to the bed of the machine and the upper one swings above the lower one and on the bolt, the head of which may be seen at the far end of the lower block just beyond the slot. The opposite, or near end, of the top parallel is provided with a set screw. By this means it is possible to square up the two ends of the cross-tie. When machining the ends of the feet the top parallel is swung up out of the way and the cross-tie is turned on edge and allowed to fall in the slot in the lower parallel. The foot is then held against movement by the clamp, as shown.—*Lehigh Valley, Sayre, Pa.*

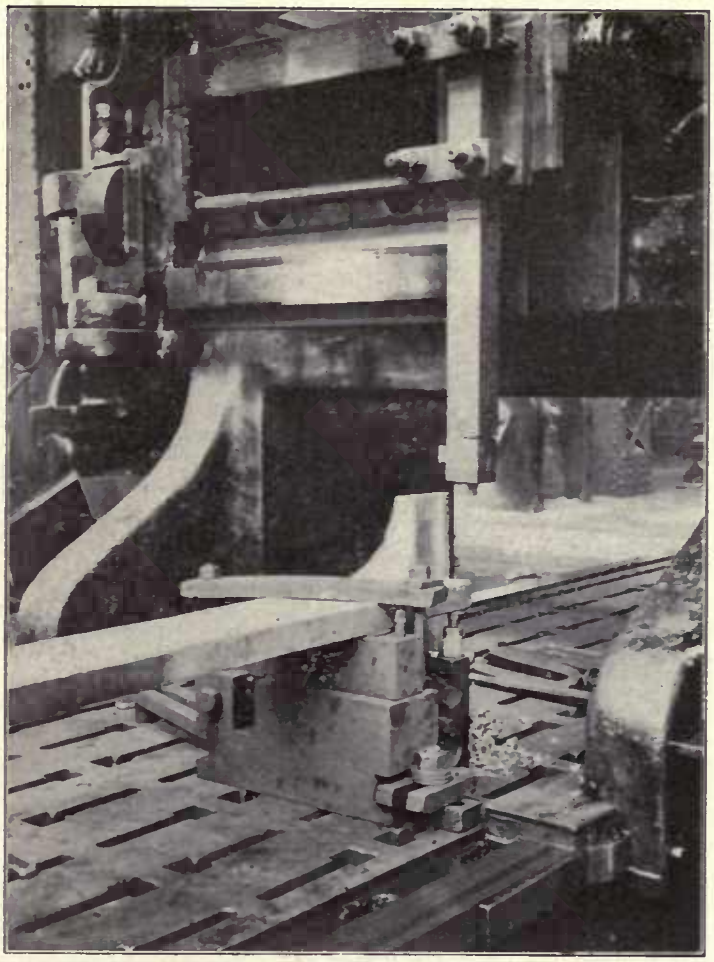


Fig. 93—Slotting the Frame Fit on a Grate Bearer Cross-Tie.

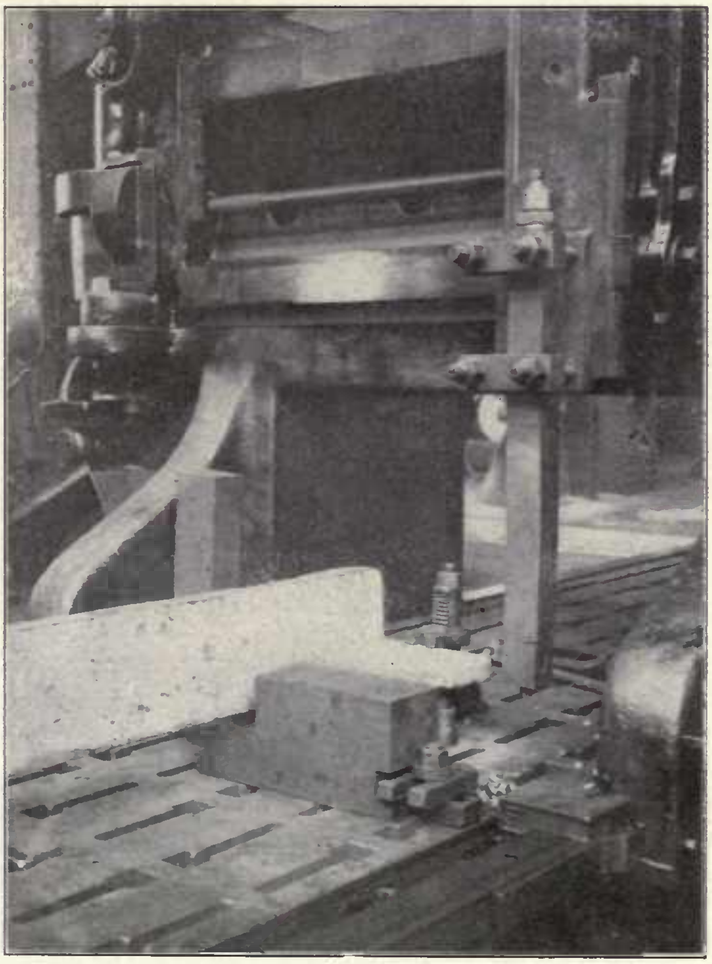


Fig. 94—Slotting the End of a Grate Bearer Cross-Tie.

GREASE CUP PLUGS, MACHINING.

With the device shown in Fig. 95, 60 grease cup plugs may be finished in one hour. A hole has been drilled through the drill press table allowing the plugs to drop through it into a box as they pass through the device. It is only necessary to clamp the chuck to the drill press table and to apply a square socket to the drill press spindle. The design of the plug is of interest. The projection at its bottom is forced into the hard grease and prevents the plug from loosening and working out. The finished plug, which is made of brass, weighs 7 ozs.; it would probably give just as satisfactory results if made of malleable iron. Another advantage of this style of plug is that the engineers do not have to loosen up a jam nut in adjusting it. The engines are supplied with a wrench similar to the one shown in the illustration, and the engineer has no difficulty in quickly tightening down the plug. The plugs should be screwed down into the cup their full length and should not be allowed to project above the top of the cup.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

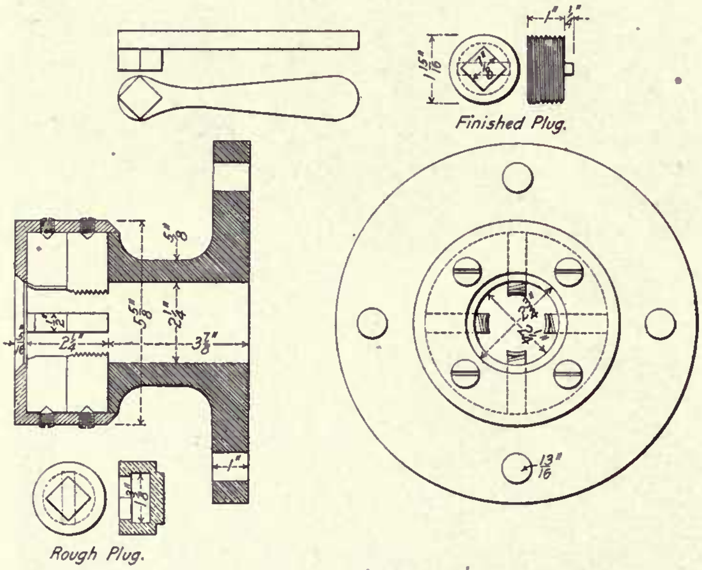



**Fig. 95—Device for Finishing Grease Cup Plugs.**

GRINDING WHEEL, REST FOR.

A simple and convenient table for use with a grinding wheel is shown in Fig. 96. It can be adjusted so that its surface is slightly below the top of the grinding wheel, and will be found especially useful for grinding light work.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

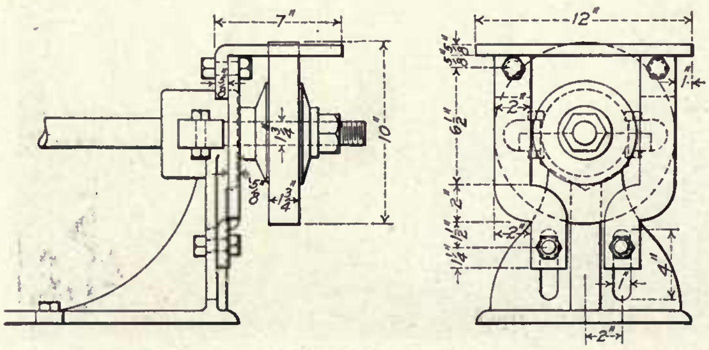


**Fig. 96—Table or Rest for Emery Wheel.**

GRINDING WHEEL ATTACHMENT FOR LATHE.

An arrangement for adjusting a grinding wheel to an ordinary lathe for grinding purposes is shown in Fig. 97. The wheel is carried by the shaft with bearings in a block bolted to the carriage. The shaft has a small pulley about 3 in. in diameter, which is belted to the line shaft. The tool is used mostly for grinding motion work pins. The countershaft has a pulley 12 in. in diameter and 36 in. long to allow for the travel of the belt, due to the movement of the carriage. The body of the device is an ordinary forging fitted with the shaft, which has pointed center bearings to take up lost motion. This apparatus can be made to fit any lathe and is especially useful on case hardened work in shops which have no special grinder.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

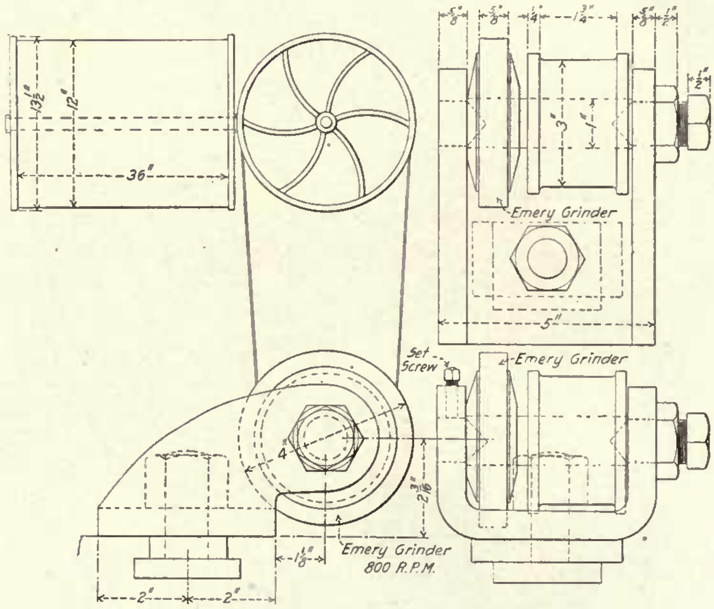



**Fig. 97—Lathe Grinder.**

GRINDING WHEEL SWITCH.

An emery wheel requires a considerable amount of power when running, even though no grinding is being done. Men who use the wheel are usually 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 of motor-driven grinding wheels is used, as shown in Fig. 98. The original switch *A* has an extension *B* bolted to the handle, and this, through the two connections and the lever *C* is connected with the upper arm of the lever *D*. This lever 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 lever is a helical spring which bears against a stop on the machine. When the grinder 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 circuit. He holds his foot on the treadle while

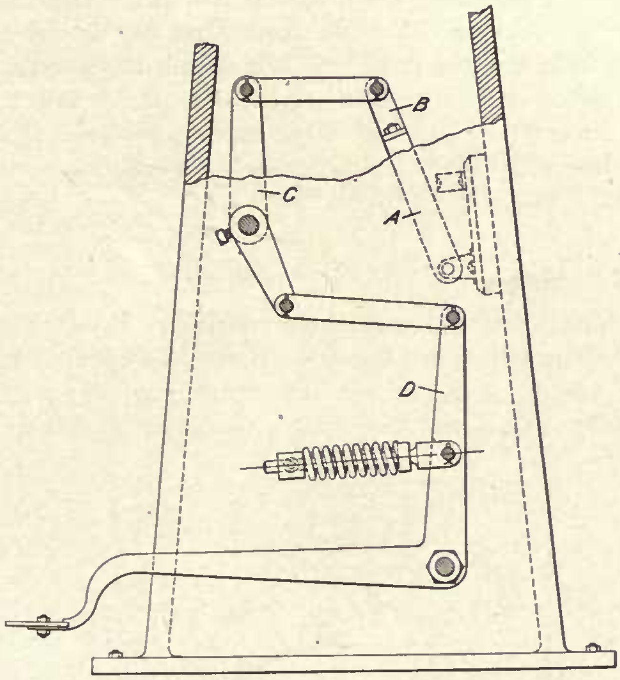



Fig. 98—Grinding Wheel Switch.

he is at work, and when he lifts it to go away the spring throws out the switch and the wheel stops.—*Delaware, Lackawanna & Western, Scranton, Pa.*

HUB PLATES, TEMPLATE FOR DRILLING.

The template for drilling hub plates shown in Fig. 99 is a simple device and can be made very cheaply of tool

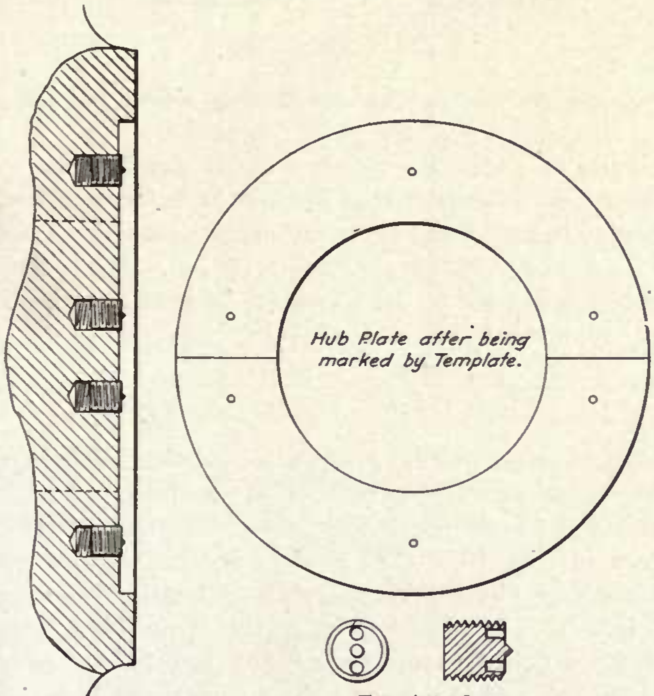



Fig. 99—Template for Marking Centers for Drilling Hub Plates.

steel. The centers, or template screws, are screwed into tapped holes in the template. It is placed on the hub plate and tapped with a hammer, thus marking the centers for drilling.—*Wm. G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

INJECTOR WATER NUTS, MILLING GROOVES IN.

A brass injector water nut, with 50 grooves milled in the top, is shown in Fig. 100. These grooves are cut on an ordinary milling machine with the aid of the special chuck shown in Figs. 101 and 102. The chuck consists of a shell *H*, a 50-tooth gear *C*, which is feather-keyed to the shaft *D* that carries the head *B;* also a handle *E,*

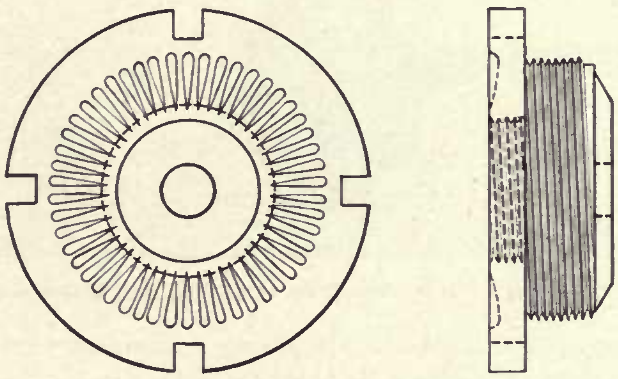


Fig. 100—Injector Water Nut.

on the end of which is fastened the cam *F*. This cam works against the follower *G*, the working faces of the cam and the follower being helices. Attached to the

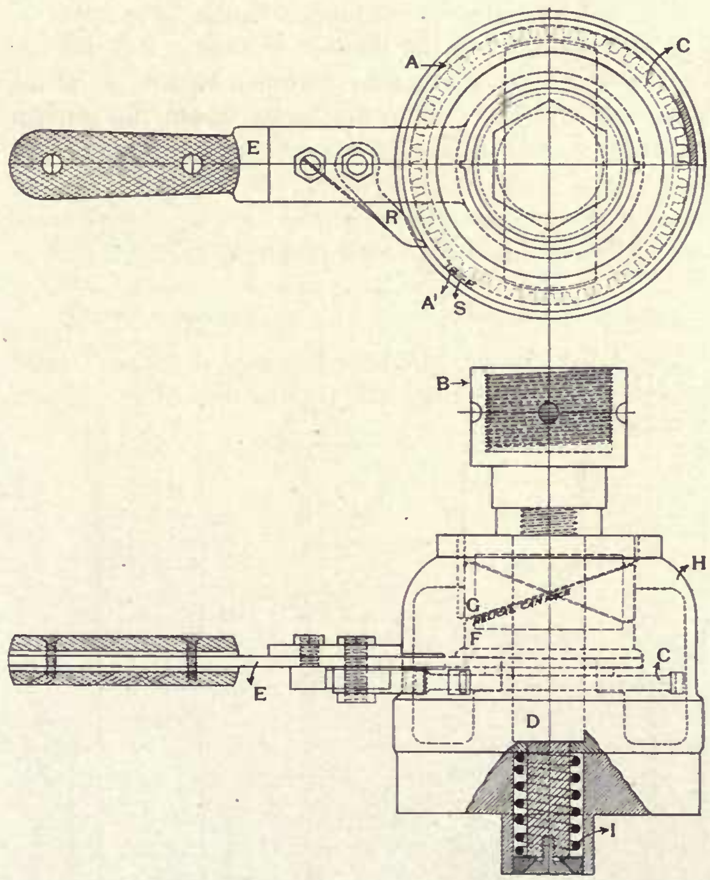



Fig. 101—Chuck for Milling Grooves on Injector Water Nuts.

handle is a ratchet *R*. The chuck is set on the bed of the milling machine and its operation is as follows: The nut to be milled is screwed into the head *B;* the handle

*E* is turned in a counter clockwise direction until the rachet *R* drops through the slot *S* in the shell *H* and engages the gear *C,* thus turning the shaft *D* to the proper position for the cutting of the first groove. The slot *S* is so designed that a movement of one-fiftieth of

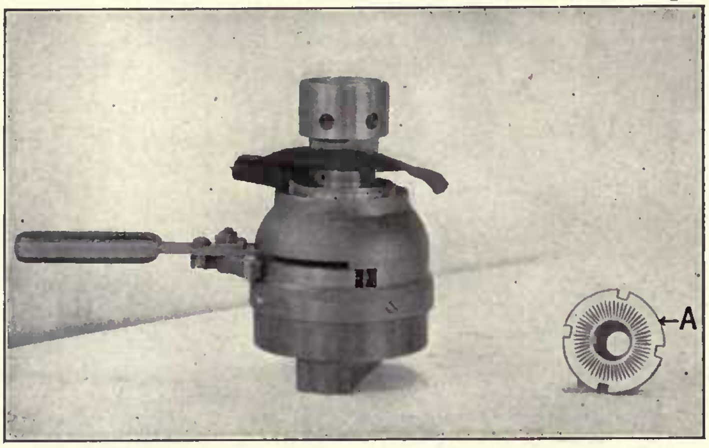



**Fig. 102—Chuck for Milling Grooves on Injector Water Nuts.**

a turn of *D* is allowed. The spring *I* furnishes friction for holding the chuck in position, while the handle *E* is turned back until the slot in *H* stops it at *A,* the slot being just wide enough from *A* to $A^1$ to allow the handle to pass through *H.* The backward movement of the handle brings the cam *F* into engagement with the follower *G,* thus raising the nut to such a height that the groove will be milled to the proper depth. The follower *G* is feather-keyed to the shell *H* so that it will not revolve with *F.* As the handle is turned back to its initial position the spring *I* pulls the chuck down, the ratchet *R* turns the gear *C* one-fiftieth of a revolution and the operation is ready to be repeated. It is possible to mill the grooves as fast as the handle can be turned back and forth.—*Chicago & North Western, Chicago.*

### JOURNAL BOX BEARING, PLANING BABBITTED TRUCK.

A tool for planing babbitted bearings of engine truck brasses is shown in Fig. 103, two strokes of the planer

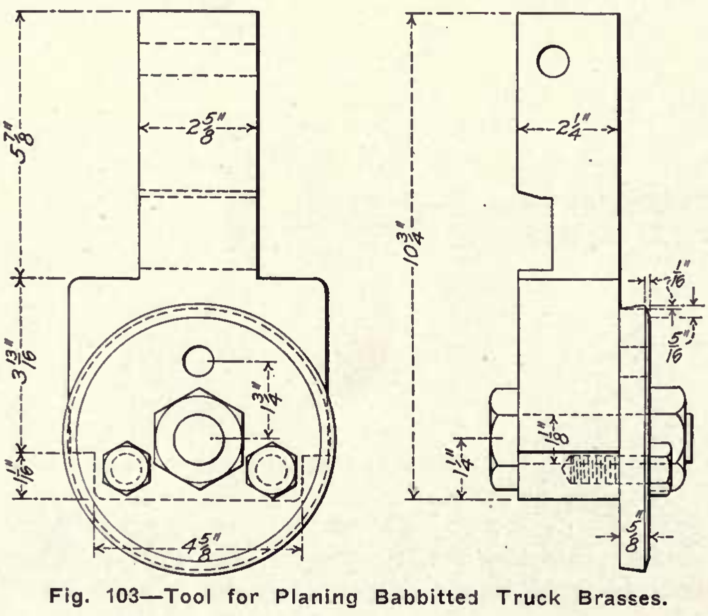



**Fig. 103—Tool for Planing Babbitted Truck Brasses.**

or shaper being sufficient in most cases to make a good bearing. The tool is a disk of a diameter to suit the brasses, ⅝ in. thick, and made of tool steel. It fits the head of a Morton draw cut shaper, but the shank may be made to suit any machine. When dull the cutter may be revolved one-third of the way, which gives a new cutting surface; it thus has three cutting surfaces which may be used before resharpening.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

### JOURNAL BURNISHER.

A burnishing tool with three rollers for driving axle journals is shown in Fig. 104. Most rollers are set in a fork, making them useless for burnishing next to the shoulder. This tool overcomes this difficulty, allowing

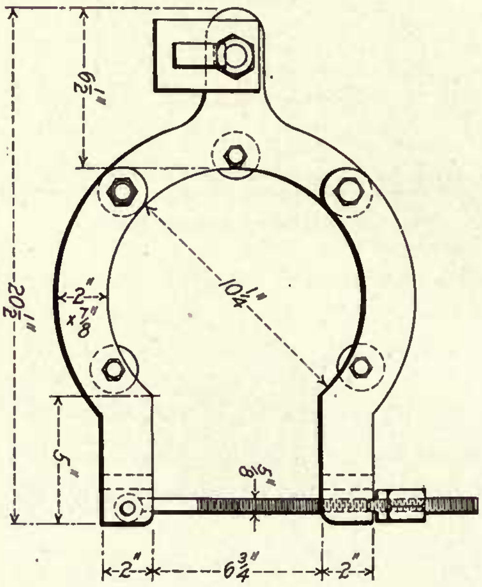



**Fig. 104—Burnishing Tool for Driving Wheel Journals.**

the rolls to go into a corner without any trouble. A smaller tool of the same style has been built for burnishing piston rods, and both are giving excellent satisfaction.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

### JOURNAL BOX CHUCK, TRUCK.

One of a set of two angle plate chucks for holding truck boxes on a boring mill while machining hub faces which have been fitted with cast brass hub plates is shown in Fig. 105. The angles, or chuck plates, are made of cast iron, with the soft steel strip, 1⅛ in. x 2½ in. x 12½ in., set in ¼ in. on the vertical face. The plates are bolted to the boring mill bed by the ⅝-in. through bolt and also by two short bolts through the oblong slots in the base. The under sides of the upper flanges of the truck box rest on the soft steel strips, and the box is held firmly by four ⅝-in. set screws, two in each chuck plate. This provides for the hub face of the box being parallel with the inner faces of one set of flanges. As there is usually considerable lateral motion

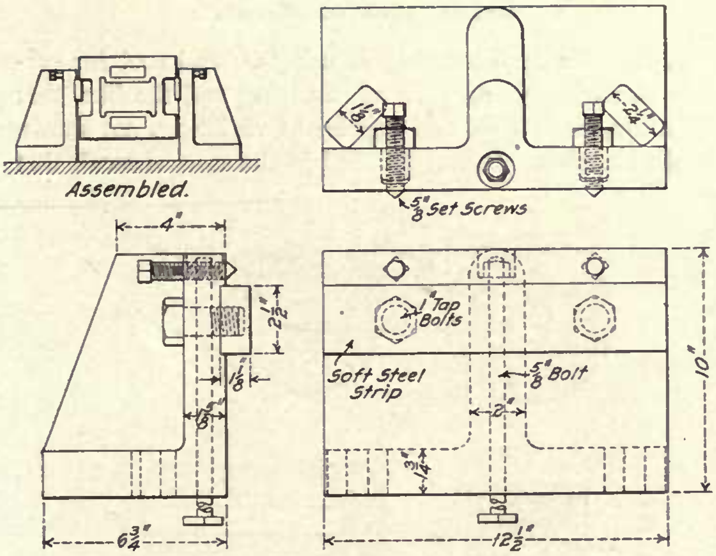



Fig. 105—Truck Box Chuck.

of the box on the pedestal jaw, the inside flange surface need not necessarily be parallel with the jaw face.—*Long Island Railroad, Morris Park, N. Y.*

JOURNALS, DEVICE FOR TURNING DRIVING.

Many driving wheel lathes are not arranged for operating at a high speed in order to turn the driving journals. A simple and convenient method of revolving the wheels and axle at a comparatively high speed on the lathe centers for performing this operation is shown in

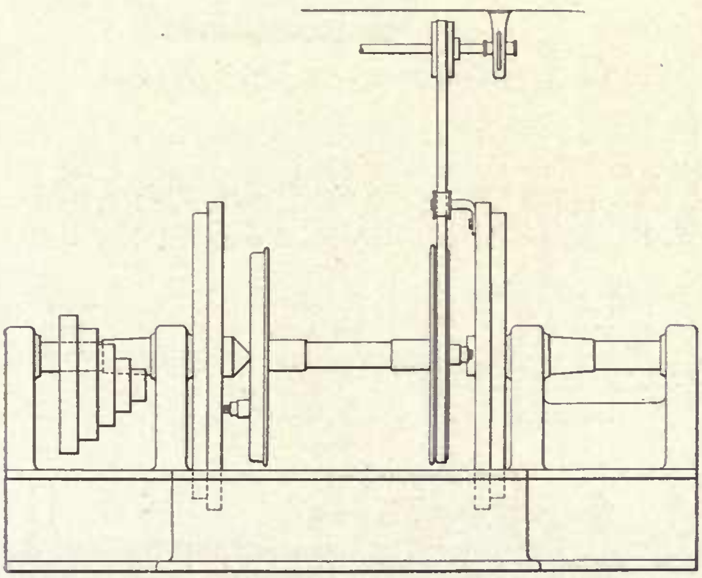


Fig. 106—Attachment on Wheel Lathe for Turning Driving Journals.

Fig. 106; a pulley on the countershaft is belted direct to one of the driving wheels as shown. The intermediate pulley is provided to make adjustment for different size wheels.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.*

JOURNALS, TRUEING TRUCK.

The journals of an engine truck are frequently worn slightly out of true and need such a small amount of metal removed that it can be done better by grinding than by turning. For such work a small base carrying an emery wheel is a handy tool. The one shown in Fig. 107 is bolted to the carriage of the lathe and the wheel is driven from an overhead drum, while the axle is revolved in the ordinary manner. In this way the

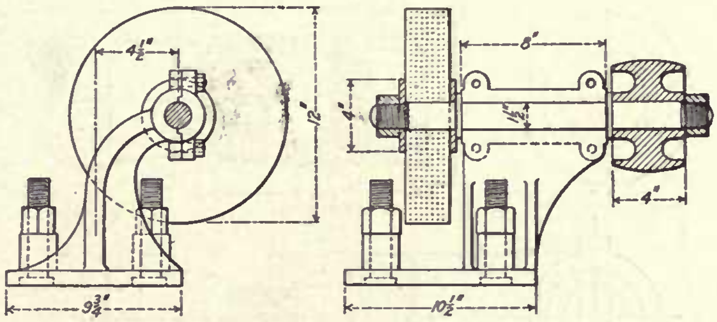


Fig. 107—Grinder for Truck Wheel Lathe.

journals can be quickly and accurately trued up with the removal of minimum amount of metal.—*Delaware, Lackawanna & Western, Scranton, Pa.*

KNUCKLE-JOINT KEYS, CHUCK FOR TURNING.

The knuckle-joint key for the side rods of mogul and consolidation locomotives has a projection ⅜ in. in diameter and ½ in. long at the side of one end. It is a troublesome thing to get at because of its small size and position. To do the work, a small chuck has been designed, Fig, 108, that has a shank to fit in the live center hole of the lathe spindle. The projecting head is split and provided with a tap bolt for clamping. The outer

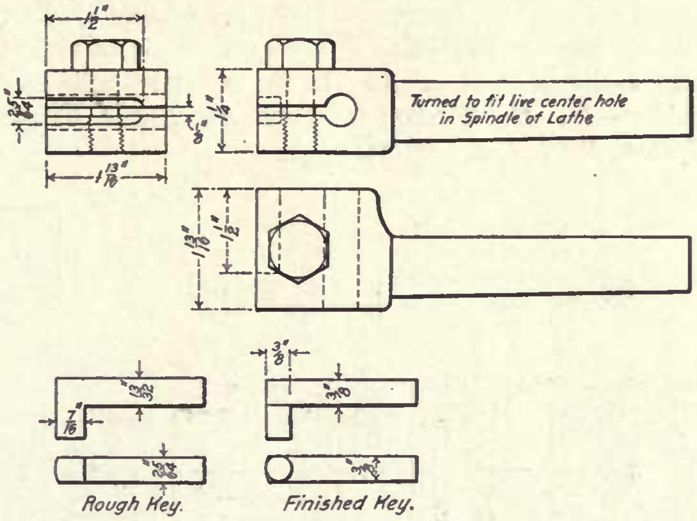



Fig. 108—Chuck for Turning Knuckle-Joint Keys.

end of the slot is cut out so that the shank of the key can be put in. Tightening of the bolt clamps the key and leaves the projection on the key so that it can be turned quickly and accurately.—*Delaware, Lackawanna & Western, Scranton, Pa.*

KNUCKLE AND WRIST PIN CHUCKS.

Slightly different designs of chucks for turning knuckle and wrist pins are shown in Fig. 109. They are designed for screwing on the main spindle of the lathe, and are notched, as shown, to facilitate removing by the use of a block and hammer. The outer end of the casting is threaded to correspond to the threads of the knuckle or wrist pin. The wrist pin chuck is arranged

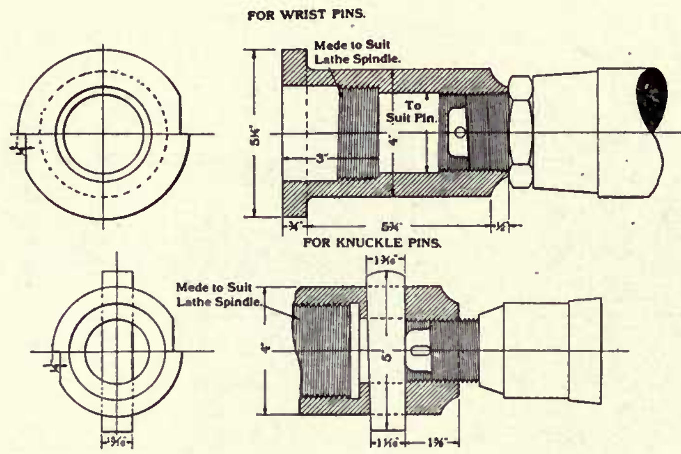



**Fig. 109—Knuckle and Wrist Pin Chucks.**

for securing the pin against a lock nut as shown, while the knuckle pin chuck has a key which bears against the end of the pin. These chucks are convenient for this class of work and are easily and cheaply made.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

LATHE CENTER GRINDER.

A pneumatic grinder for lathe centers is shown at *E* and *G* in Fig. 175 and in Fig. 110. It is made from a rotary air motor originally designed for drilling 3/16-in. tell-tale holes in staybolts. It is comparatively small and may easily be held in place in the ordinary lathe tool holder.—*M. H. Westbrook, Foreman, Grand Trunk System, Battle Creek, Mich.*

LATHE, END TOOLS FOR.

A German machine shop is using an end tool for certain classes of work, such as centering and the like, that is handy, easily used and capable of variations not shown in the sketches. It may be used in the case of stock that

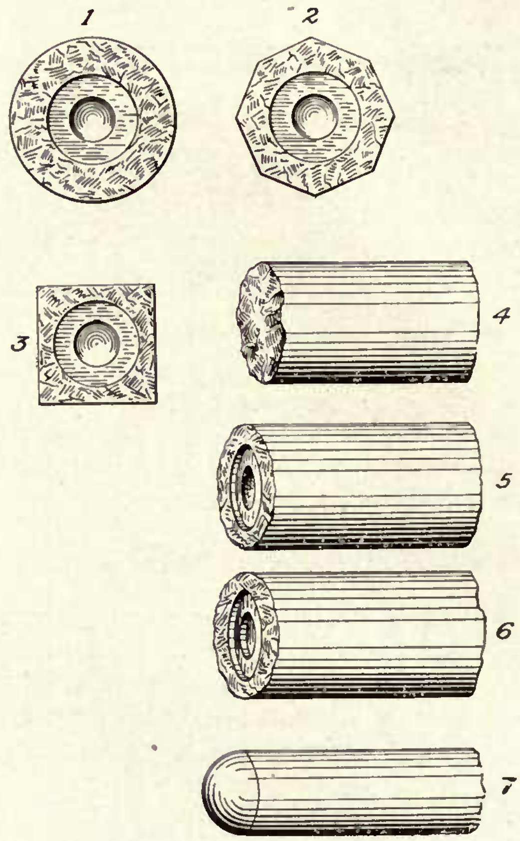



**Fig. 111—Work Done by End Tool on Lathe.**

is to be worked off or centered, as shown in Fig. 111, Nos. *1*, *2* and *3*, showing round, square and octagonal sections, respectively; No. *4* shows the bar as it is broken off, No. *5* with the end milled and centered, No. *6* with

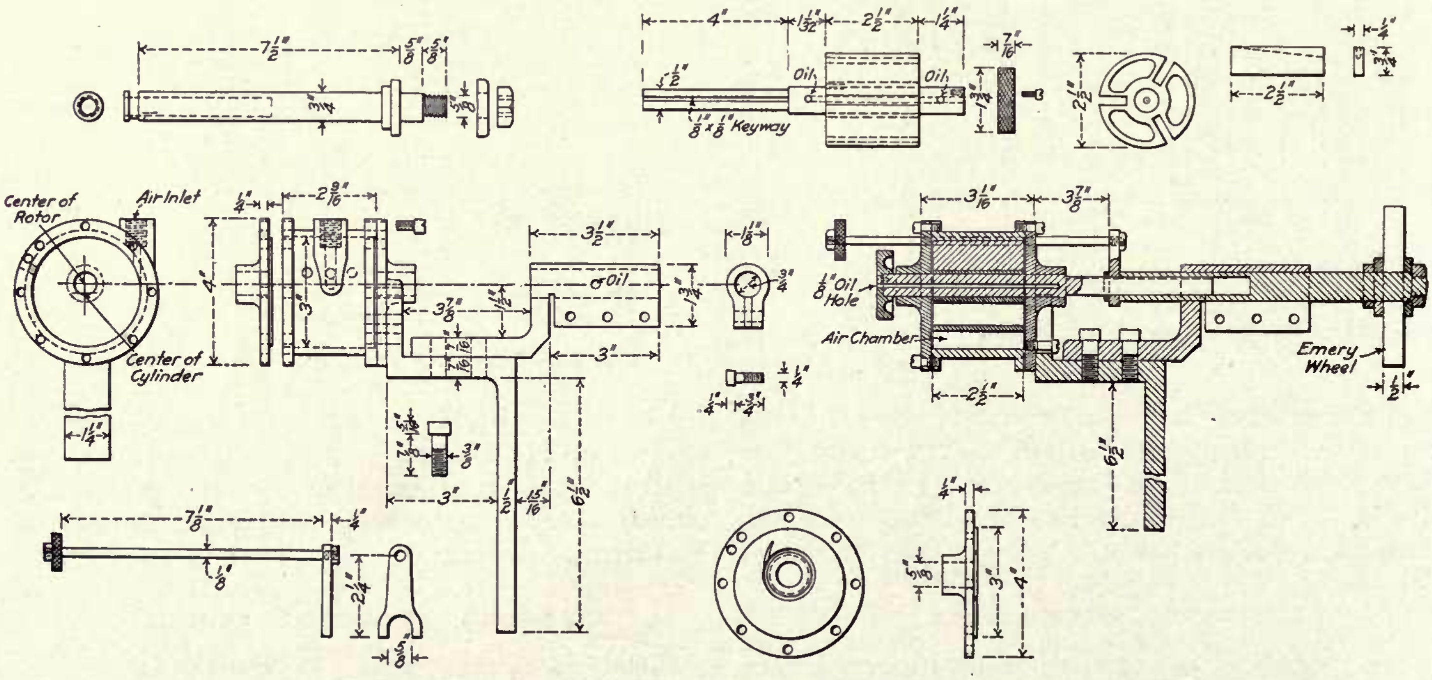



**Fig. 110—Details of Lathe Center Grinder.**

the end milled and center bored; No. *7* is a small rod turned or milled with a hemispherical end to correct centers. One form of the tool which centers and end mills is shown in No. *8* (Fig. 112). There is a sliding center drill, which makes a 60-deg. countersink in the end, of a depth and diameter dependent on the amount of projection of the bit. The rest of the tool forms an end mill with two cutting faces. Where center boring is desired the tool, instead of being slotted, is merely drilled to accommodate the small flat drill, No. *9*. For ball milling, as in No. *7* (Fig. 111), the bit is made as shown in No. *10* (Fig. 112). The same holder may be used for either the countersink or ball tool.

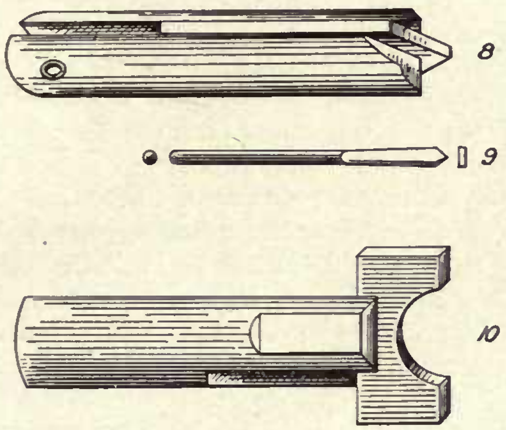


**Fig. 112—End Tool for Lathes.**

LATHE TOOL HOLDER.

A tool holder for use on lathes is shown in Fig. 113. It is made of machine steel for all sizes of lathe tools and is designed to hold the tool at the proper angle and form a rigid support for the cutting edge. This will allow small-size high-speed tools to be used on heavy work without vibration and chatter. The economy in high-speed steel is also an important point. The holder is clamped in the tool post and the wedge hinged on a pin is arranged above the tool and clamped down on it. —*S. S. Lightfoot, Bonus Demonstrator, Atchison, Topeka & Santa Fe, San Bernardino, Cal.*

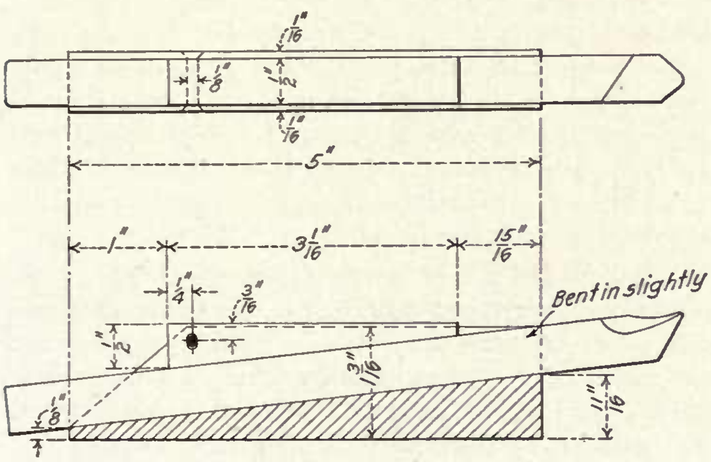


**Fig. 113—Lathe Tool Holder.**

LATHE TOOL HOLDER.

A heavy duty boring and turning tool for use on engine lathes is shown in Fig. 114. It is used in place of the tool post and is clamped to the slide rest by two ¾-in. bolts as shown on the drawing. After the holder is placed in position it is unnecessary to remove it for grinding the cutter, which may be easily removed and replaced by slackening off and tightening the set-screw.

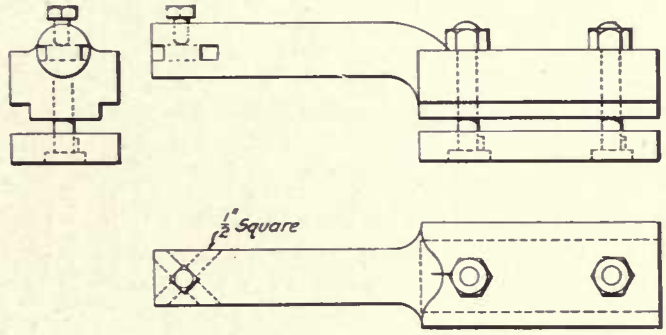


**Fig. 114—Heavy Duty Boring and Turning Tool.**

The cutting tool is made of ½-in. square tool steel and may be set to bore on either side. The time consumed in turning rod bushings, for which it is used almost entirely, has been reduced about 35 per cent.—*A. S. Willard, Foreman, Norfolk & Western, Crewe, Va.*

LATHE TURRET TOOL HOLDER.

A simple lathe turret tool holder, to carry four tools, which may easily be constructed, is shown in Fig. 115. Each tool is held securely in position by two ½-in. setscrews, and the turret head is clamped to the carriage of the lathe by tightening the nut on the 1-in. bolt about which it revolves.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic; Henry Holder, General Foreman, and James Findlay, Machine Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

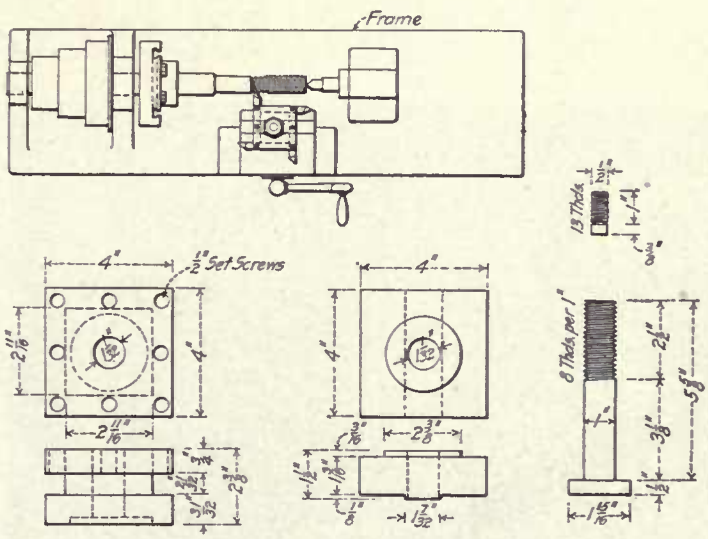


**Fig. 115—Turret Tool Holder for Lathe.**

### MILLING CUTTERS, GRINDER FOR.

A certain shop bought a milling machine, which was used extensively, but had no accurate means of grinding the cutters. There happened to be a small lathe bed handy that had been discarded. The head and tail stocks were removed, and in their places brackets, *A A* (Fig. 116), were placed. These were bored to take the mandrel *B*. A bearing with a shaft, pulley and emery wheel was attached to the carriage and was driven by an overhead drum. The milling cutter *C*, to be ground, was put on the mandrel and the latter was clamped by the set-screws in the brackets *A*. Adjustments were made by easing off on the screws and turning the mandrel. The traverse of the emery wheel was accomplished by hand through a feed screw, not shown, and by the adjustment of the cross feed of the carriage. Rather crude for fine work, but it served its purpose for many months in a pretty big shop.

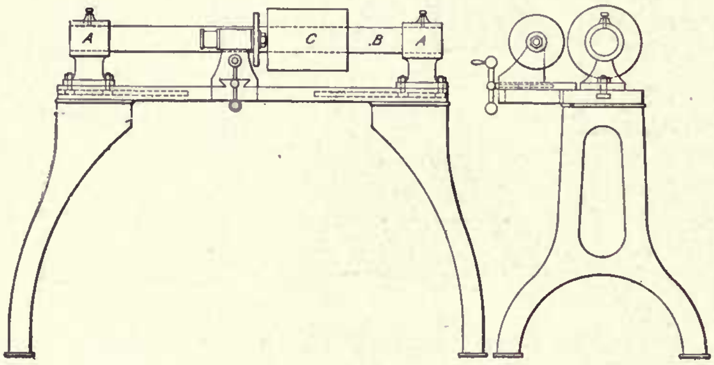



**Fig. 116—Improvised Grinder for Milling Cutters.**

### MILLING CUTTERS, GRINDING ON ARBOR.

A method of sharpening milling cutters while on their arbors is shown in Fig. 117. A portable adjustable head carries an emery wheel which is driven by a belt from an air motor supported on a suitable frame. This method is considered an improvement over grinding them in the usual way in the tool room, as frequently after severe duty the arbors become slightly sprung, which results in two or three teeth having to do most of the work. In many ways this method has proved superior to the general practice. The portable grinder has been found useful for other purposes.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

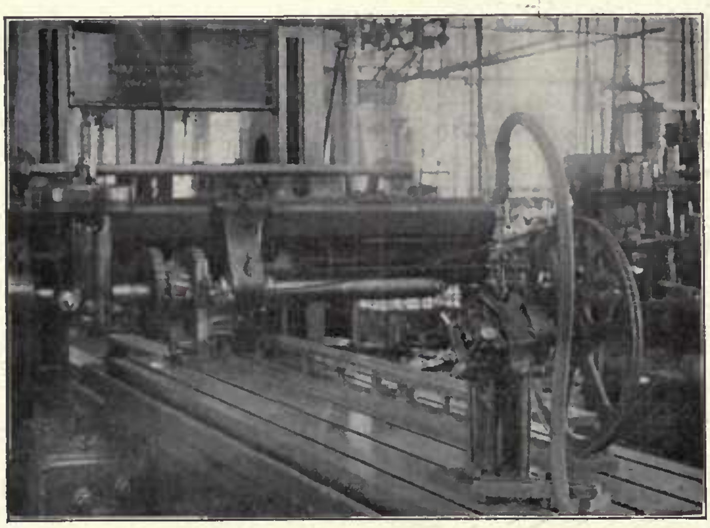


**Fig. 117—Sharpening Milling Cutters in Place on Arbor.**

### MILLING CUTTERS, IMPROVED.

A new form of spiral milling cutter used by the Cincinnati Milling Machine Company is illustrated in Fig. 118. The spacing between the teeth is 1¼ in., and this allows ample room for the chips, the space being about four times as great as in the usual standard cutter. The chip made by a milling cutter is quite different from that produced by a lathe or planer tool. The latter makes chips of uniform section, while the section of a milling chip increases from zero to a maximum. When the cutter revolves it penetrates into the work and compresses it, which results in a springing of the arbor. After a certain amount of spring, the blade begins to remove a chip. It is believed that this action more than any other causes a dulling of the cutter. With a light cut it is possible that one tooth would fail to take a chip and the succeeding tooth would remove the double amount of its normal cut. This action is inherent in milling cutters, and experiments have recently been made by the Cincinnati Milling Machine Company for the purpose of discovering some method of minimizing these results.

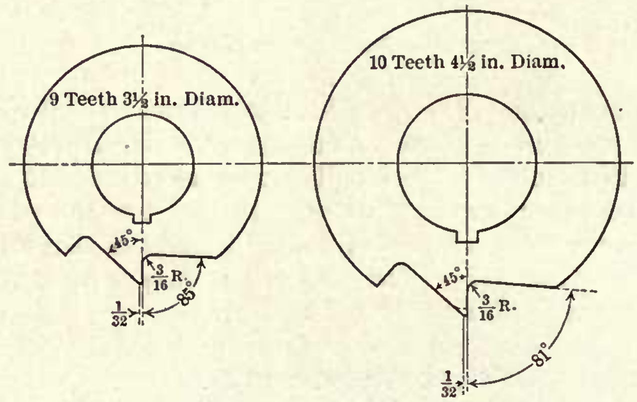



**Fig. 118—New Form of Spiral Milling Cutter.**

The ability of a milling cutter to remove metal is also limited by the relation between the size of the chip and the space between the teeth. This limitation does not exist with lathe or planer tools, as the chips or turnings have ample space in which to flow off. It was found that with the ordinary spiral milling cutters the amount of metal removed per tooth was sufficient to fill the chip space, and the capacity of the cutter was limited to small output; but when the space between the teeth was increased to allow ample room for the chip, a given amount of metal was removed with less power. This fact has led to the adoption of standard cutters 3½ in. in diameter, with only 9 teeth and 4½ in. in diameter with 10 teeth, corresponding to a spacing of 1¼ in. between the teeth. The chip space is thus made four times as large as that in general use at the present time.

By the use of these improved milling cutters, the amount of metal removed per horse power has been largely increased, and the capacity of the knee and column milling machine has been considerably enlarged

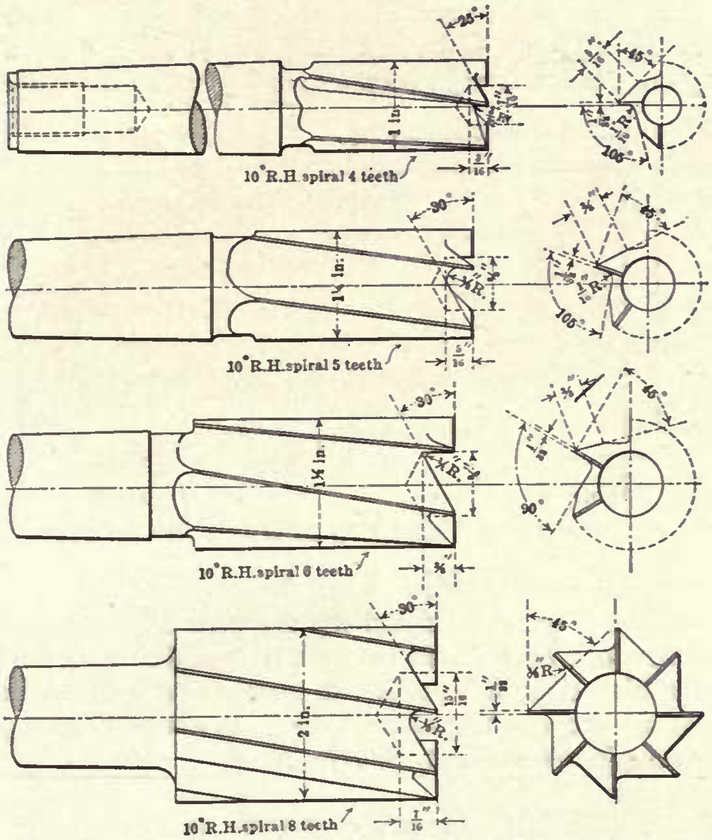



Fig. 119—New Type of Taper Shank End Mills.

without increasing its size or weight. Experience with the cutters has shown that they have other advantages, and few, if any, of the minor disadvantages which might have been expected. In roughing ordinary work the wide-spaced cutter remains sharp for a longer period, even where the feeds have been increased, and in many cases double the amount of work can be done without re-sharpening. With a smaller number of teeth, it is also found that the time required for re-sharpening is only one-half that for the fine-toothed cutter.

The ratio of the pitch to the depth of tooth is practically the same as with the older form, and the depth of the new tooth is about twice as large as formerly, so that the cutter can be sharpened a greater number of times, and its life is thereby considerably increased. Another advantage of the wide-spaced tooth is the fact that, while at first glance it has the appearance of weakness, it is stout and well proportioned, and while breakage of the old cutters is not frequent, the new ones do not break, even when subjected to the heaviest class of service. It might be thought also that the wide spacing of the teeth would cause the feed to act with a jerk, but the feed is smoother and there is less jerk when the cutter first strikes the work, because there is less spring in the arbor, which is made larger than formerly, and there is less tendency for the cutter to ride over the work.

The new spiral cutter is particularly well adapted to milling cast iron, and with it there is a notable absence of jerking and chattering which is often found in milling this material. Where very smooth finish is required it has been the custom to use a roughing cutter with a chip breaker, followed by a fine-toothed cutter without the breaker, and this requires a large number of extra cutters. Another advantage of the wide-spaced cutter is the fact that the chip breaker can be used without affecting the smoothness of the finish, and only one cutter is required for roughing and finishing.

The new standard end mills used by the same company are shown in Fig. 119. The 1-in. mill has only four teeth, and the 2-in. mill has eight teeth. In cutting, these mills are remarkably free. A 2-in. end mill will cut a slot 1 1/16 in. deep in cast iron at the rate of 6 in. per minute. The same cutter removed a section from the end of a casting 1½ in. wide and 1½ in. deep with a feed of 11 in. per minute. A similar cut 1 in. by 1⅛ in. in section was taken with a feed of 33 in. per minute.

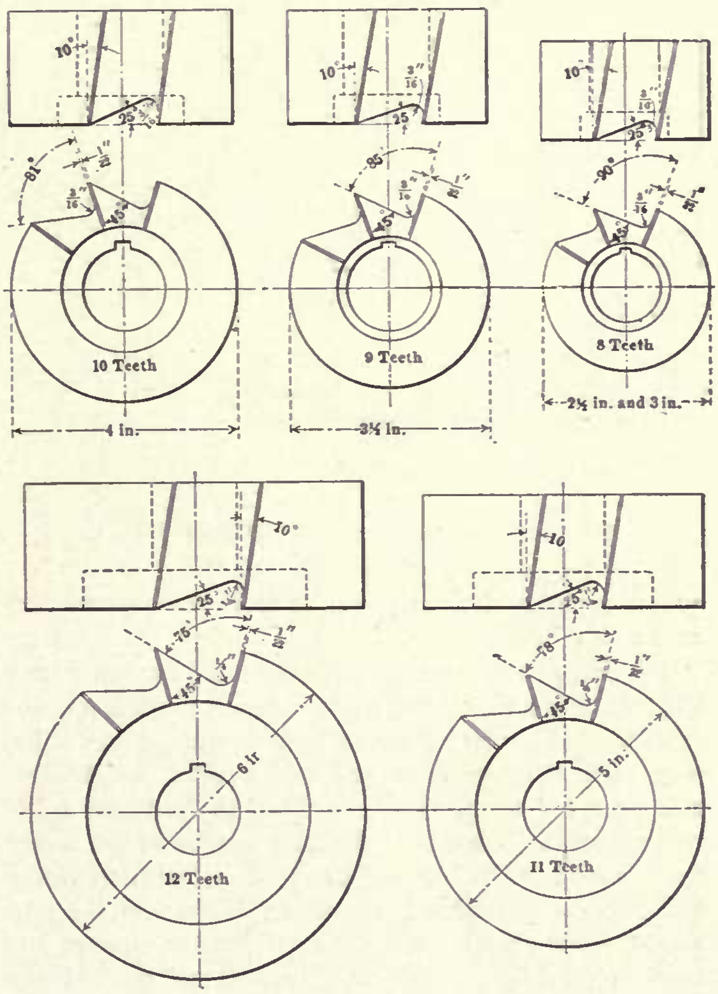



Fig. 120—Spiral Shell Milling Cutters.

Shell end mills of the wide-spaced type are shown in Fig. 120.

Perhaps the most interesting improvement is that shown in Fig. 121, illustrating the new type of helical cutter as designed by the Cincinnati Milling Machine Company. These cutters are very efficient when working on steel, and the power consumption is extremely low compared with that of ordinary cutters, the tests showing that a roughing cut in steel requires only one-third the power of an old-style spiral mill. The chips come from the work in the form of gimlets with the back burnished, and the surface shows no sign of tearing of the metal.

The peculiar feature of these cutters is that they push the chip off in the direction of the axis of the cutter, or at right angels to the feed. The power consumption for cutting steel is so low that a roughing cut requires only about one-third the power used by the old-style spiral mill. For cast iron their performance is not so favorable. As they do not make revolution marks, a much coarser feed can be used for finishing, and a cutter with three teeth will allow a finishing feed three times as fast as the ordinary spiral cutter. On account of the direction of thrust being parallel with the axis of the arbor, there is a complete absence of spring in the arbor in cutting steel. This fact makes it possible to use the

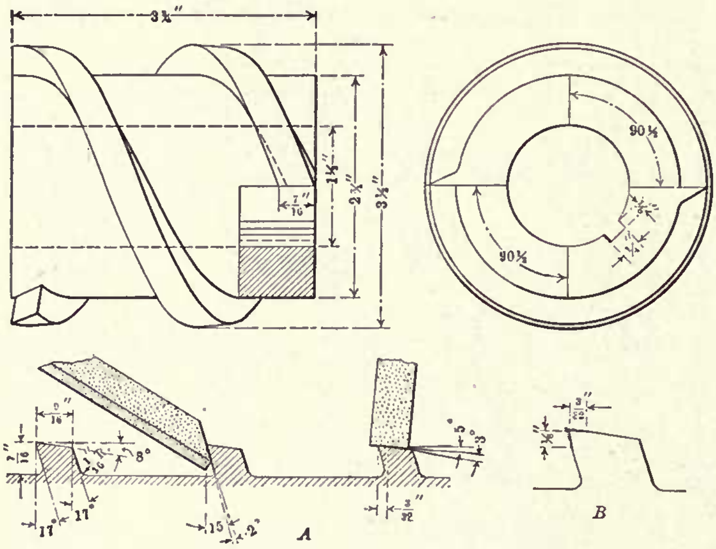


Fig. 121—Details of New Type of Helical Milling Cutter.

milling machine without braces in most cases where they would be otherwise needed.

The end pressure on the spindle is not excessive, and although the interlocking right and left-hand helix was made to obviate this objection, little advantage was found from it in this respect. The best results are obtained when running at the usual speeds of the ordinary spiral cutter, and the new cutters show a remarkably low power consumption in cutting steel as compared with any other form of cutter. Mr. DeLeeuw explains why the new helical cutter shows a less saving in power on cast iron than on steel by saying that a cutting tool must detach the chip by bending and partially breaking it. When cutting steel, the radius of curvature of the chip becomes greater with increased rake, and the extent to which the chip is broken off becomes less. Cast iron allows much less bending before breaking, so that even with the increased rake, the chip is still broken up, as when the usual form of spiral is used, and no saving of power is possible.

These illustrations are from a paper on the "Efficiency of Milling Cutters," by A. L. DeLeeuw, in the *Journal of the American Society of Mechanical Engineers* for April, 1911.

### OIL CUP, MACHINING SOLID.

The tool shown in Fig. 122 was designed for use on the boring bar of a horizontal milling machine for finishing solid side rod oil cups. The tool is held on the boring bar by a ½-in x ¼-in. key. The arm of the tool has a ½-in. slot cut through it on an angle in which the cutter

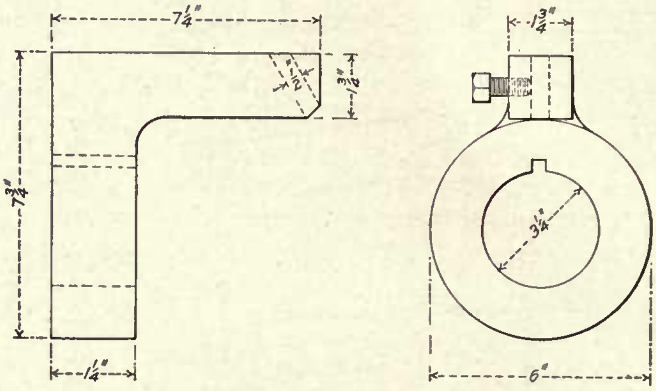


Fig. 122.—Tool for Machining Solid Side Rod Oil Cups.

is held by the set-screw. After the outside of the cup is finished a counterbore and tap are used on the inside. These tools have shanks to fit the ends of the boring bar. By this method it is possible to complete the work on an oil cup at one setting of the rod.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### OIL CUP, MACHINING OUTSIDE OF SOLID.

A device for machining the outside of solid rod cups, rocker arm bosses, etc., on a drill press, is shown in Fig. 123. The sleeve at the upper end fits over the drill

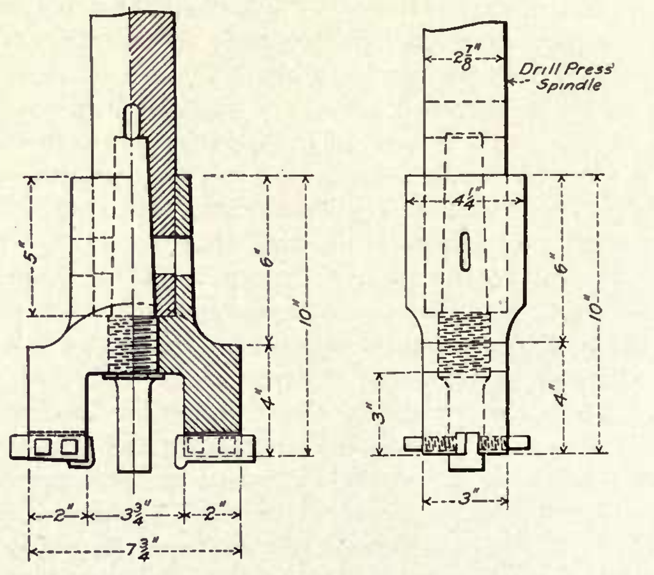



Fig. 123—Tool for Machining the Outside of Solid Rod Cups.

press spindle and is held in place by a flat taper key. The forked end is milled at the ends of the two forks to take ½ in. x 1½ in. tools which are secured by set-screws as shown. One of the tools is made with a straight face for finishing the rod at the bottom of the cup, and the other is rounded for the finishing cut and filleting. The tool with the straight face at the bottom is set a little in advance of the other tool and takes a roughing cut on the side of the cup as it is fed down, the other tool following it with a finishing cut. Cups may be finished on the outside in fifteen minutes with this tool. A pin may be placed in the center of the tool, which will act as a guide and furnish stability during the operation. Different sizes of these pins may be used for different classes of work; in turning a cup or boss a hole is first drilled for the insertion of the pin. The tool may be used with or without the pin, as the nature of the work requires.—*R. E. Brown, Foreman, Atlantic Coast Line, Waycross, Ga.*

### PISTON RING GANG TOOL.

A gang tool for turning and finishing cylinder piston rings is shown in Fig. 124. While it is usual to employ gang tools for cutting off the rings, this device includes

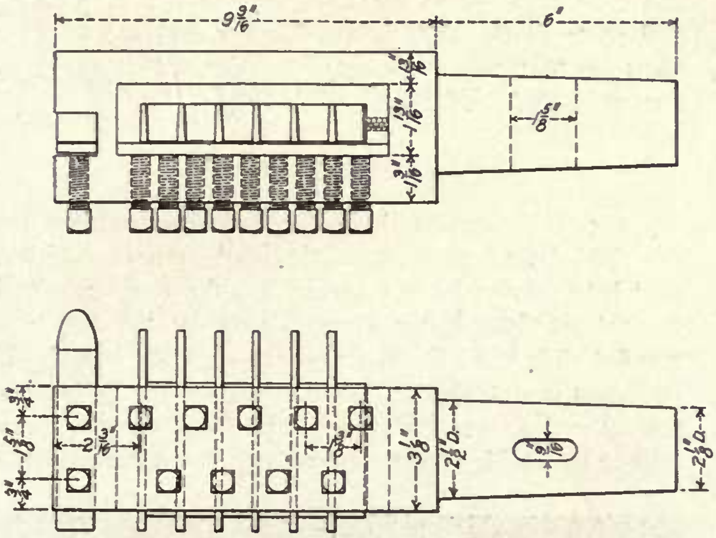


Fig. 124—Piston Ring Gang Tool.

a roughing tool on the same holder as the six cutting-off tools. The rough casting is just large enough to permit of cutting five rings and is finished on the inside with a regular cutting tool on one of the two heads of the boring mill. The outside is turned with a tool in the second boring head and the rings are separated and finished on the sides by the narrow cutters. The number of rings finished by the ordinary method with a single tool is one per hour, while the gang cutter will finish three rings per hour.—*Chicago, Milwaukee & St. Paul, West Milwaukee, Wis.*

### PINS, PNEUMATIC CLAMP FOR DRILLING.

A four-spindle drill, equipped with a gang of pneumatic clamps and jigs for drilling holes in pins, bolts, etc., is shown in Fig. 125. To operate the clamp, air at a pressure of 85 lbs. is admitted to the cylinder *A*, and the lever *B* is forced down on the pin. The jig *C* is fitted with a set of bushings whose inside diameters correspond to the sizes of the drills used. The clamp is shown in detail in Fig. 126.—*Chicago & North Western, Chicago.*

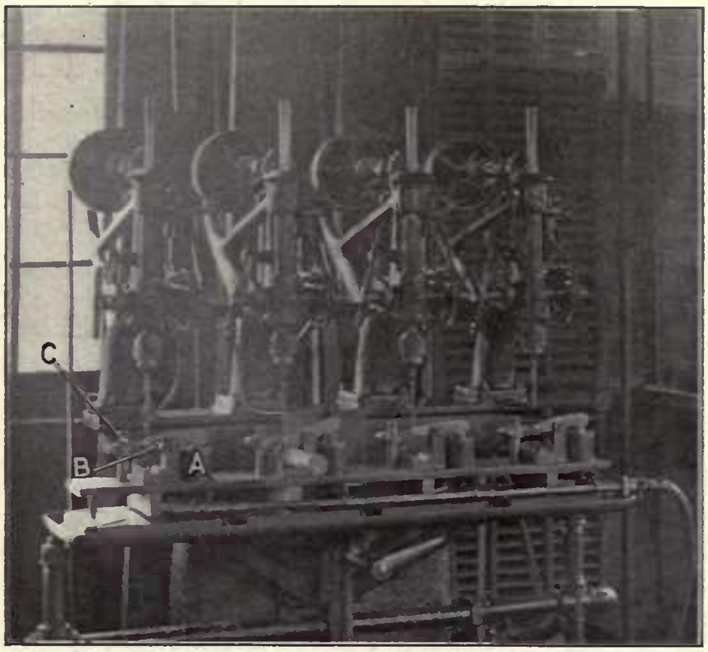



Fig. 125—Pneumatic Clamps and Jigs for Boring Holes in Pins.

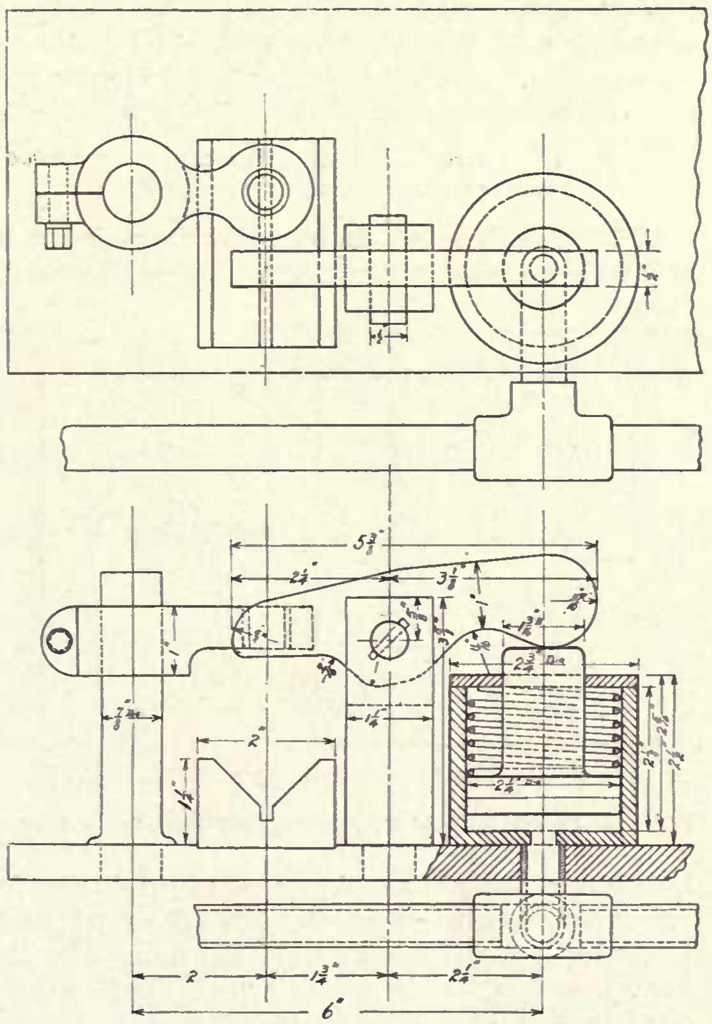


Fig. 126—Pneumatic Clamp and Jig for Drilling Pins, Etc.

### OIL CUP, UNDER-CUTTER FOR SOLID.

With the advent of side and main rods having oil cups forged on them it became necessary to devise a tool for cutting the clearance space at the base of the threads inside the cup. This can be done by using a small cutter on a vertical spindle. In this case, however, it is necessary to have the spindle of a diameter sufficiently small to allow for feeding the tool into the work, with the result that the tool chatters and the cut is generally unsatisfactory. The tool shown in Fig. 127 was designed to ob-

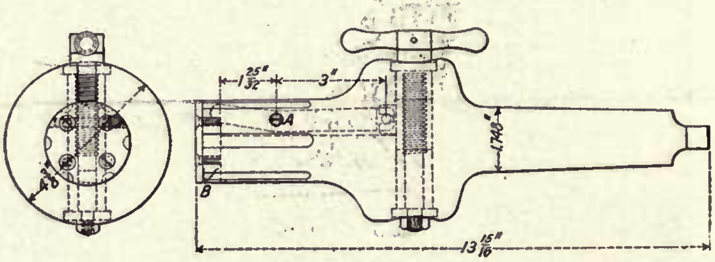



**Fig. 127—Solid Oil Cup Under-Cutter.**

viate these difficulties. Its outside diameter is made slightly less than that of the hole drilled for tapping. The cutting edge of the tool is seen at *B*. The opposite end of the cutter receives the end of the lever which is fulcrumed at *A*. Power is applied to force the cutter outward through the square threaded screw. The circular plate, fastened by four countersunk screws, holds the cutter within the tool. The six flutes provide for gathering the cutterings. This tool is for use in a drill press and has a standard Morse taper shank.—*Erie Railroad, Meadville, Pa.*

PEDESTAL CHUCK, ENGINE TRUCK.

At the Silvis shops only the top end of the engine truck pedestal is machined, where it fits the frame. This work

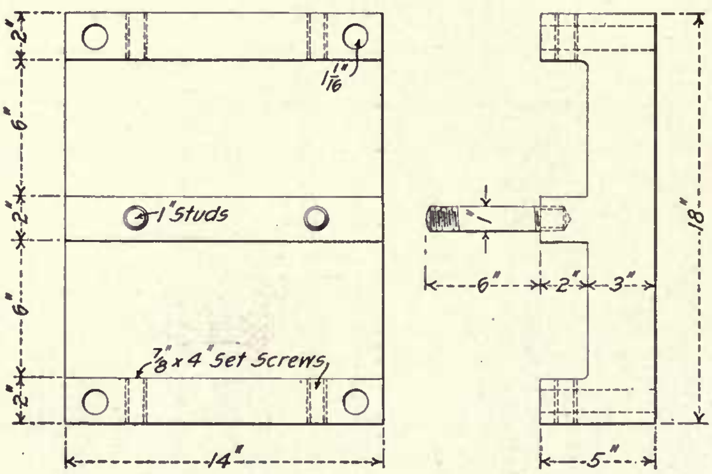



**Fig. 128—Chuck to Hold Engine Truck Pedestals on Slotter.**

is done on a slotter in a minimum amount of time by the use of the chuck shown in Fig. 128. The chuck holds two pedestals at a time, square with the cross-feed. The 1 x 6-in. studs clamp the pedestals to the chuck, and the chuck itself is bolted to the table by 1-in. bolts through the four 1 1/16 in. holes. In practice the pedestals are placed in the chuck and the four set-screws are set up by hand; the pedestals are then drawn down solid by two horseshoe clamps used in connection with the two 1-in. studs, after which the set-screws at the side are tightened with a wrench. In connection with the chuck a new tool post has been designed (Fig. 129). These

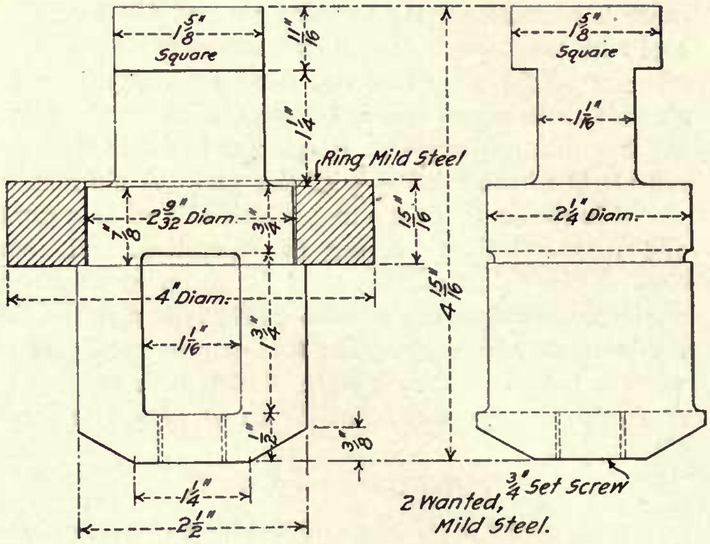



**Fig. 129—Special Tool Post Used on Slotter for Machining the Ends of Engine Truck Pedestals.**

tool posts fit the slots in the clapper and are set 6 in. apart so that two tools may be operated at the same time.—*Rock Island Lines, Silvis, Ill.*

PISTON RING MANDREL.

The piston ring mandrel, Fig. 130, consists of a cast iron bell-shaped cone on a threaded spindle, which is held between the lathe centers. On the same spindle is pressed the flat casting, on which the slotted dogs with tapered ends to fit the taper on the cone are bolted. By turning the nut shown just in front of the bell-shaped cone, the dogs are forced outward from the center and engage the inside of the ring, as shown. A driver, which

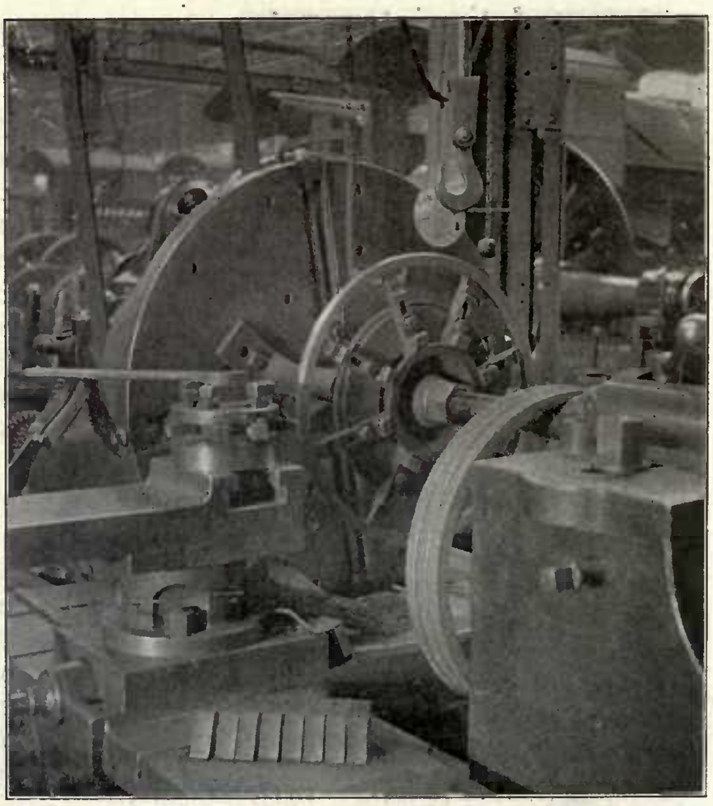


**Fig. 130—Piston Ring Mandrel.**

is bolted to the faceplate, engages a dog on the spindle, thus driving the mandrel. Several unfinished rings are shown hanging on the tail-stock center, and just back of the mandrel is an iron hook on which the finished rings may be hung. On the carriage in the foreground is shown an extra set of dogs for use on rings of larger sizes, which do not come within the limits of the dogs shown on the mandrel.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic; Henry Holder, General Foreman, and James Findlay, Machine Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

### PISTON RING MANDREL.

An expanding mandrel for holding piston rings for turning on a lathe is shown in Fig. 131. It consists of a casting, bolted to the faceplate of the lathe, which has a conical opening in its front face. Extending down to this opening from the circumference are a number of small dogs, which are expanded by driving a cone into the tapered hole. This cone is forced into the mandrel by the large nut, expanding the mandrel and holding the ring rigidly in position for turning. The use of this device has given very good satisfaction at our shop.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

### PISTON RING MULTIPLE PARTING TOOL.

Piston rings may be cut from the finished stock very rapidly with the tool shown in Fig. 132. The 2-in.

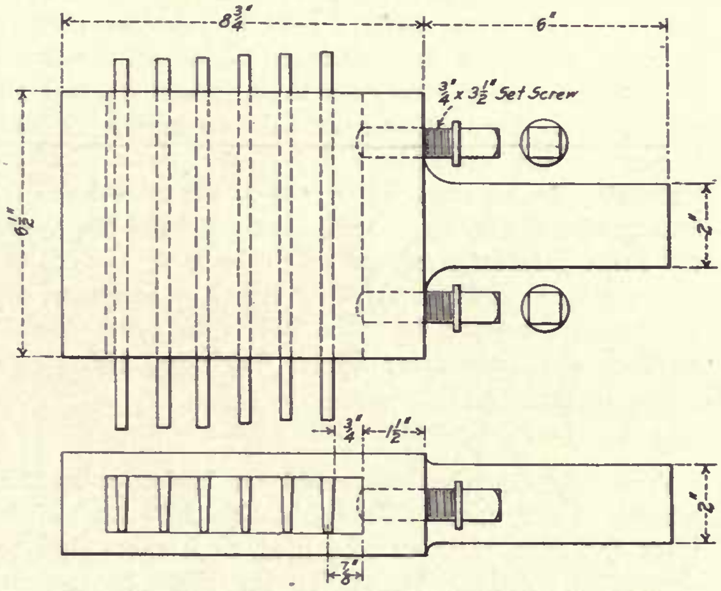



Fig. 132—Gang Tool for Cutting Apart Piston Rings.

square shank is held in the tool post in the usual manner. The body of the tool is made of steel, with a 1¼-in. x 6¼-in. slot machined through it. There are five 1¼-in.

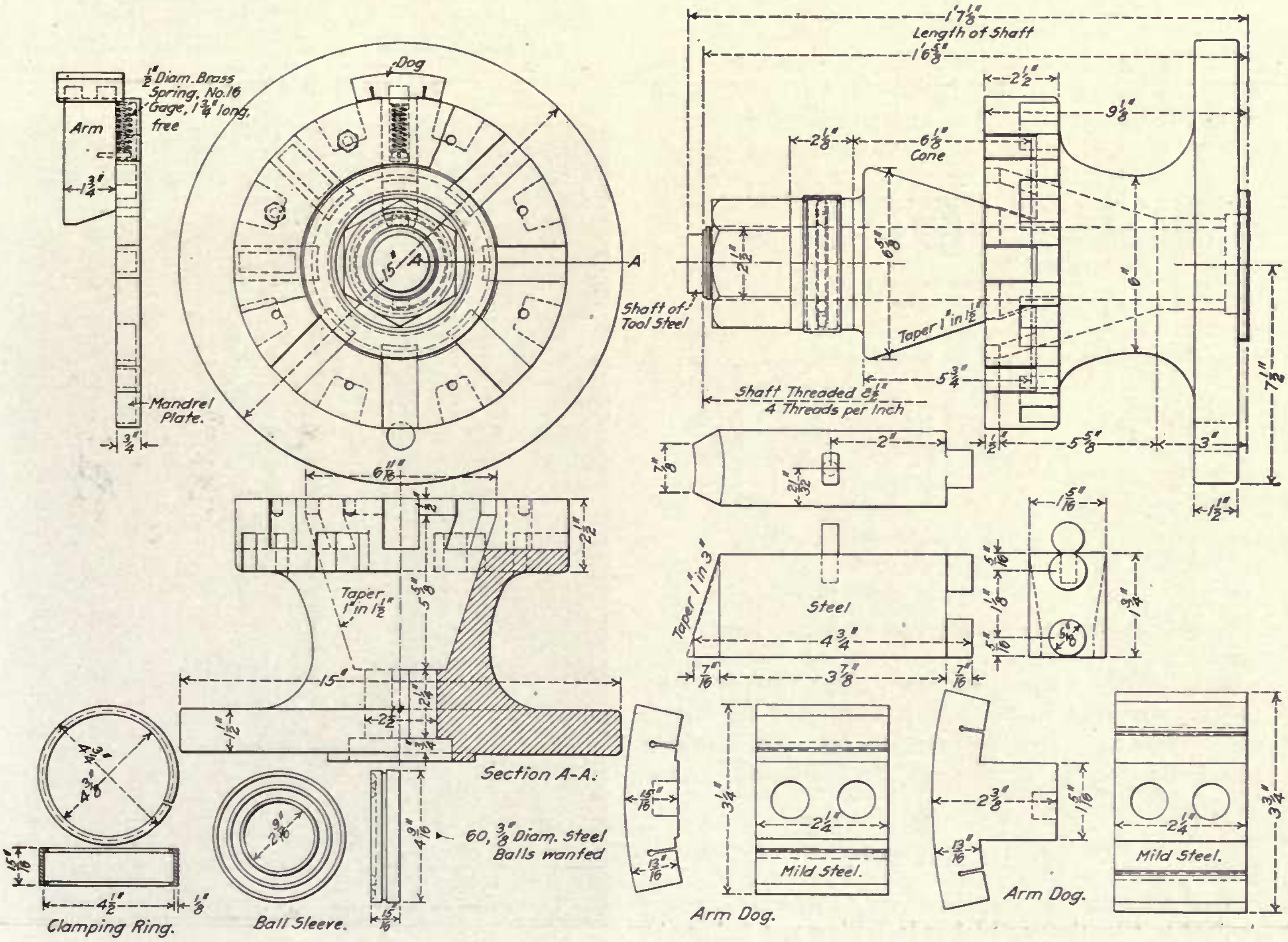



Fig. 131—Piston Ring Mandrel.

x 6½-in. blocks, tapered from ¾ in. at the top to 27/32 in. at the bottom, and two blocks having this same taper on one side, but square with the top and bottom on the other. These two blocks fit at the ends of the slot in the tool body, while the tapered ones lie on 1-in. centers along the slot. The five cutters, of high-speed steel, are 10 in. long with tapering sides to fit against the tapered filler blocks. The cutting tools and filler blocks are held in place by the two ¾-in. x 3½-in. set screws. Before tightening the set-screws, the ends of the cutters should be adjusted at slightly varying distances from the work, the cutter farthest from the tool post being in advance of the others. This provides for the rings being cut off successively, working from the end of the stock.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### PISTON RING MULTIPLE PARTING TOOL.

A multiple parting tool used on boring mills for making piston rings is shown in Fig. 133. A tool is made for each width of ring used, as it takes time to change the spacing blocks for the rings of various

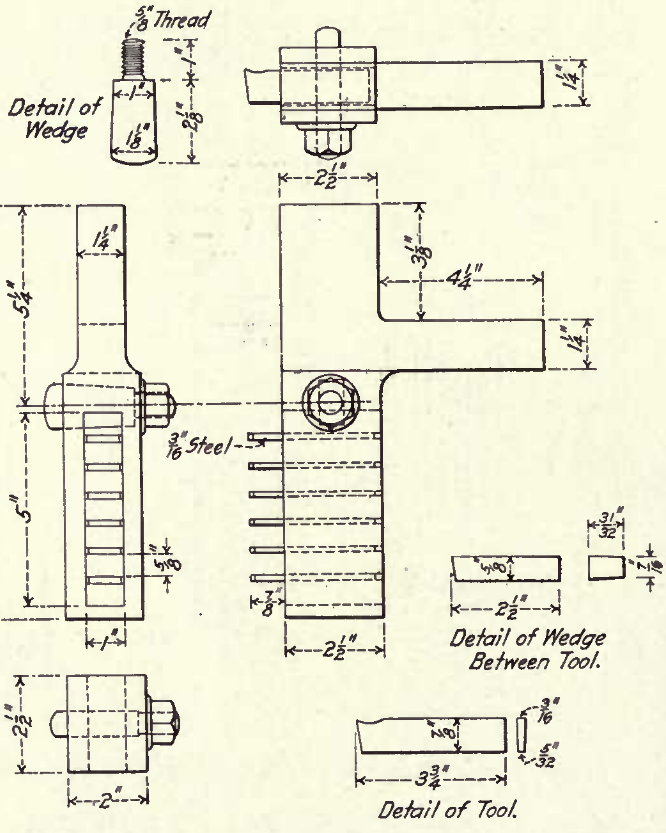



**Fig. 133—Multiple Parting Tool for Piston Rings.**

widths. When properly adjusted, these tools are used to part the rings to the correct width and no facing-up is necessary after they are cut off. The drawing shows the tool in detail.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

### PISTON RING SAW.

The machine illustrated in Figs. 134 and 135 was devised to save time and labor in cutting and fitting piston rings. Ordinarily they are cut with a hack saw and

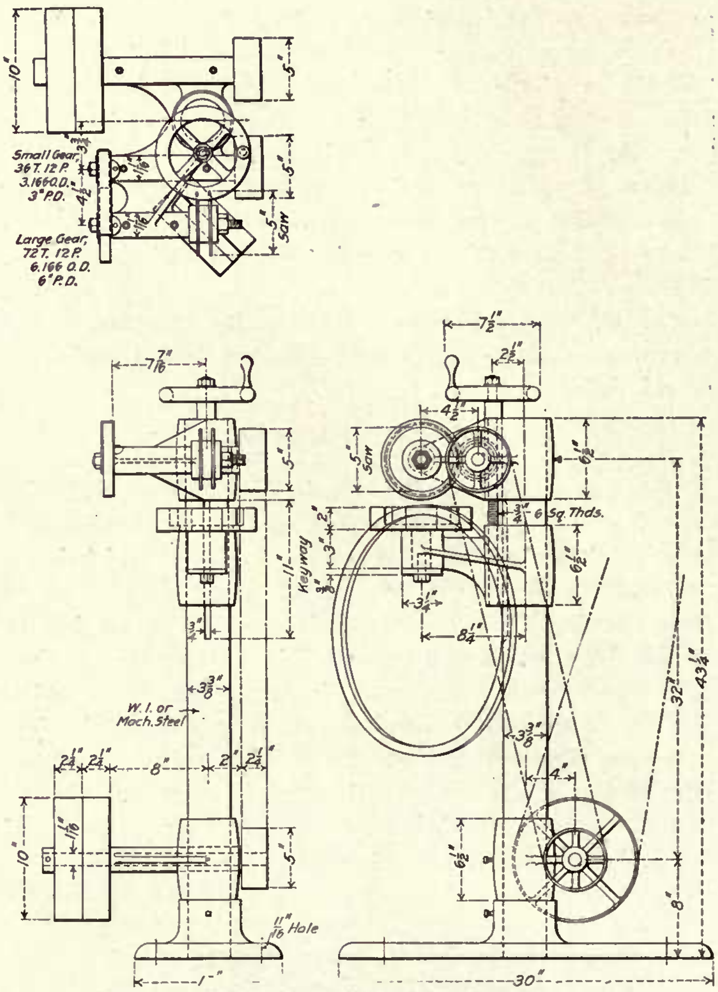



**Fig. 134—Piston Ring Saw.**

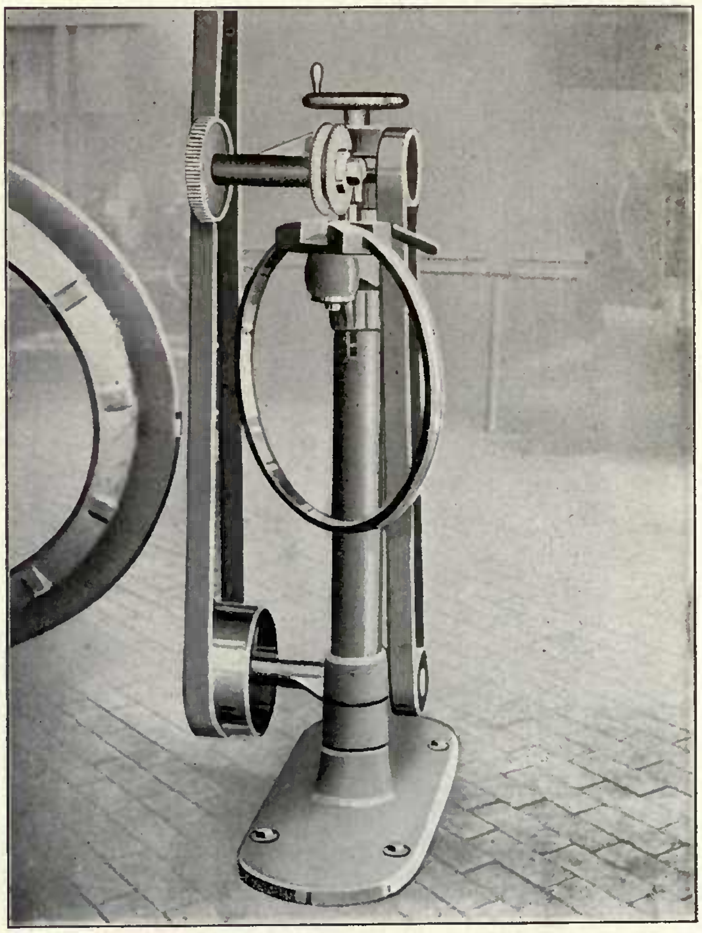


**Fig. 135—Piston Ring Saw.**

filed to fit, which usually takes from 15 to 30 minutes; with this machine the same work may be accomplished in one minute, making a much better fit. The 1/16-in. x 6-in. slitting saws are used with an adjustable collect between them to give the desired width of gap. The ring is held in a swivel chuck, making it possible to cut it at any desired angle. The chuck may be raised or lowered by the hand-wheel and ¾-in. screw. The rings are gripped in the chuck by set screws. The machine as shown is belt driven, but by extending the driving shaft with a suitable connection either an air or electric motor may be used, and it may then be readily converted into a portable machine, if desired. It has been used for three years with splendid results.—*W. H. Fetner, Master Mechanic, and C. L. Dickert, General Foreman, Central of Georgia, Macon, Ga.*

### PISTON RING TOOL.

A tool for use on a lathe for finishing up Dunbar piston rings is shown in Fig. 136. The sliding tool holder provides for setting the tool to finish a number of rings to a given size and in case of the tool's cutting edge wearing, it is only necessary to readjust the tool. The steel guide pin receives the side thrust of the ring, and, if desired, both sides of the ring may be machined at the same time by replacing this guide pin by a cutting tool. The work for which this tool was designed was formerly done with a forked tool, through the ends of which steel

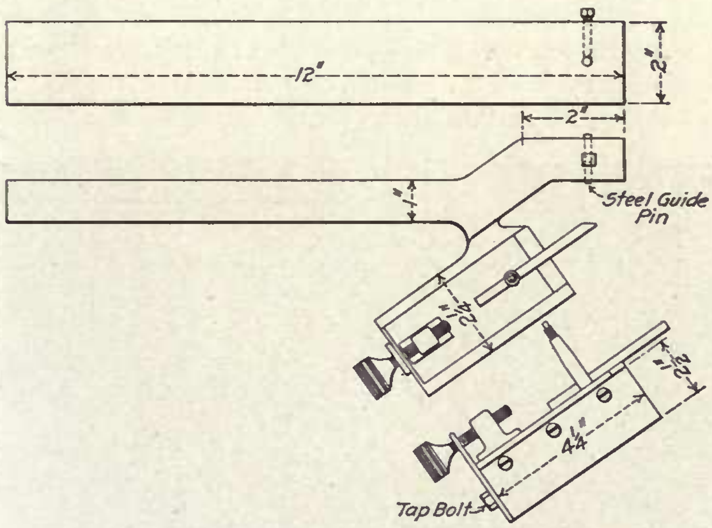



Fig. 136—Piston Ring Tool.

cutters were driven at an angle and were held by set screws. It was difficult, however, to get the fine adjustment of the cutting edges which is possible with the tool shown.—*Central Railroad of New Jersey, Elizabethport, N. J.*

### PISTON RING TOOLS.

We make piston rings with the tools shown in Fig. 137 in the following manner: A vertical boring mill with two heads on the cross-rail is used, and is operated at a cutting speed of about 30 ft. per minute. The left head is used for the roughing cut at a feed of ⅛ in. per revolution, and then for a finishing cut at a feed of ⅜ to ½ in. per revolution. The right head is used for cutting the rings to the desired width with the special tool shown in the upper right hand corner of the drawing. It is made of six ¼ in. x 1 in. high speed steel tools, separated from each other by strips of steel, whose width is the width of the rings, plus the thickness of tissue paper, this extra thickness being allowed for finish, which is accomplished by slightly raising and lower-

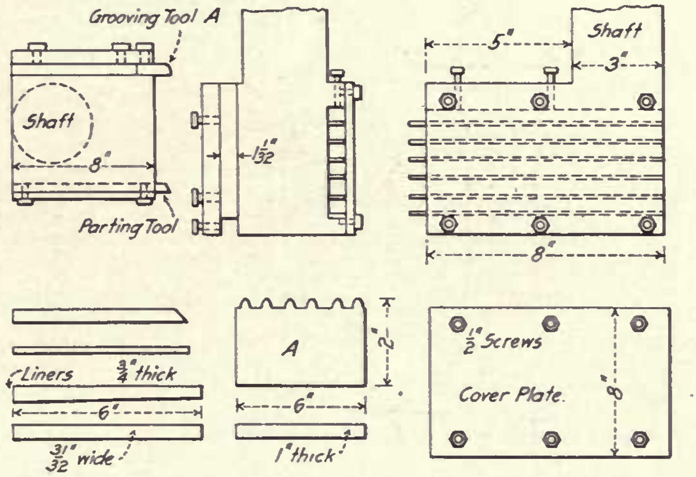



Fig. 137—Tools for Making Piston Rings.

ing the head with the parting tool after it has cut to the proper depth. The pocket in the tool, which contains the six tools, should be 1/32 in. less in depth than the thickness of the tools, so that the cover plate when placed over the tools will hold them firmly. The set screws at the top of the head also clamp the tools and spacing strips firmly in place. After the first six rings are finished, if it is desired to groove them so that the bearing on the cylinder walls may be reduced, another tool, *A*, should be inserted in the other side of the head. Very little time is thus required for separating and finishing the rings, for while the left hand head is roughing and finishing the outside of the casting, the right hand head is separating and grooving the rings. In boring off these rings it is not necessary to raise the head to remove each ring separately, as they will ride in place and time is saved by taking them off four or six at a time. With this device we have been able to reduce the cost per ring 33 per cent. Forty-five rings, from 20 in. to 22 in. in diameter, are finished in 10 hours. That part of the tool, or head, which holds the grooving tool may be used for a variety of other purposes, often making it possible to do odd jobs on the machine without removing the tool from the head.—*John V. Le Compte, Assistant Foreman, Baltimore & Ohio, Garrett, Ind.*

### PISTON RING TOOLS.

The tool shown in Fig. 138 was designed for cutting off piston rings in a high-duty lathe. The illustration shows the tool at work parting piston rings. It consists of a heavy tool post bolted to the carriage, with the cutting-off tools set in and held by set screws in the ordinary way and spaced the proper distance apart to give the correct width to the rings when they are separated. It can also be used for the roughing and finishing tools for turning as shown in the illustration, these two tools being operated simultaneously.—*Frank Rattek, Brighton, Mass.*

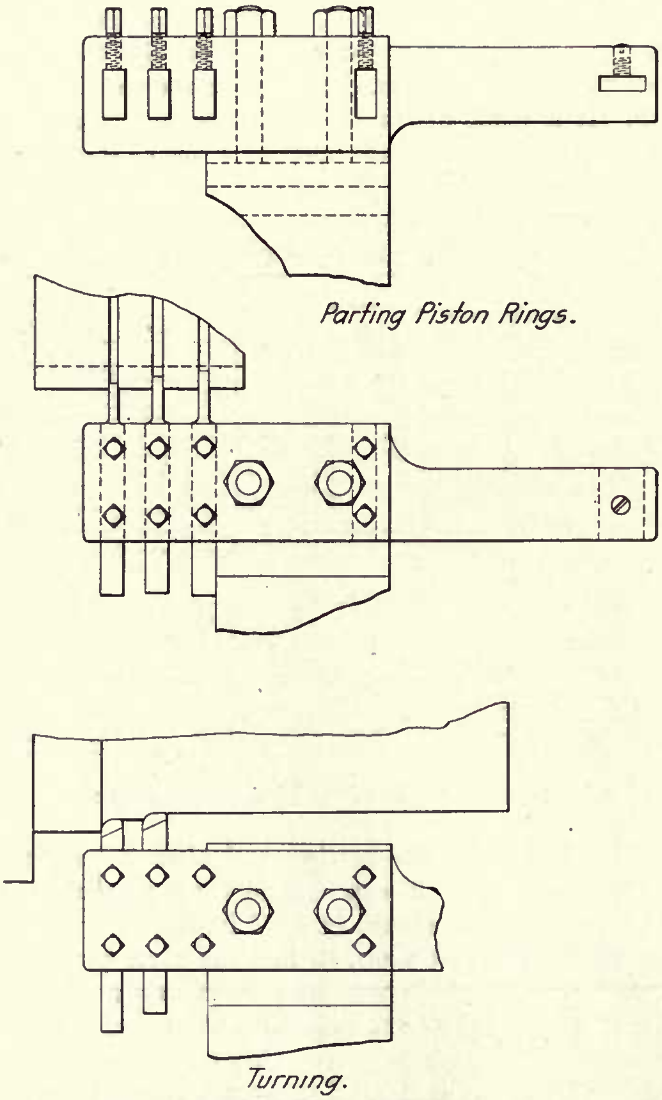


Fig. 138—Piston Ring Tool.

PISTON ROD OIL HEATER.

It is not necessary to heat spring piston rods in the blacksmith shop and hurry them to the lathe centers for straightening, when a heater similar to the one shown in Fig. 139 is used. The oil supply is kept in the reser-

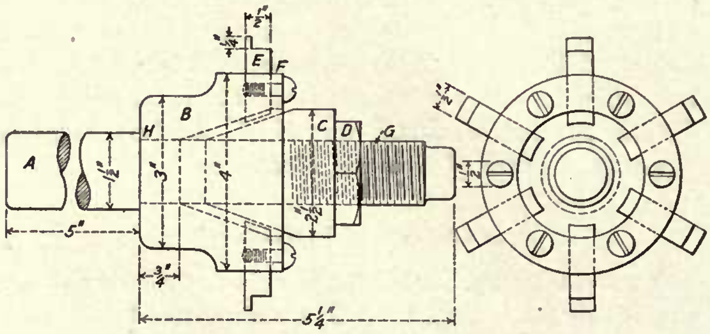


Fig. 140—Piston Rod Packing Ring Mandrel.

voir mounted under the furnace, and the furnace may be easily rolled alongside of the machine.—*Lehigh Valley, Sayre, Pa.*

PISTON ROD PACKING RING MANDREL.

The mandrel shown in Fig. 140 is designed for use on a lathe for turning piston rod packing rings. The shaft *A* has a shoulder *H* against which the part *B* bears, being shrunk on. This part is also tapered as shown to receive the cone *C*, which is driven against the end of the jaws *E*, causing them to move out against the pack-

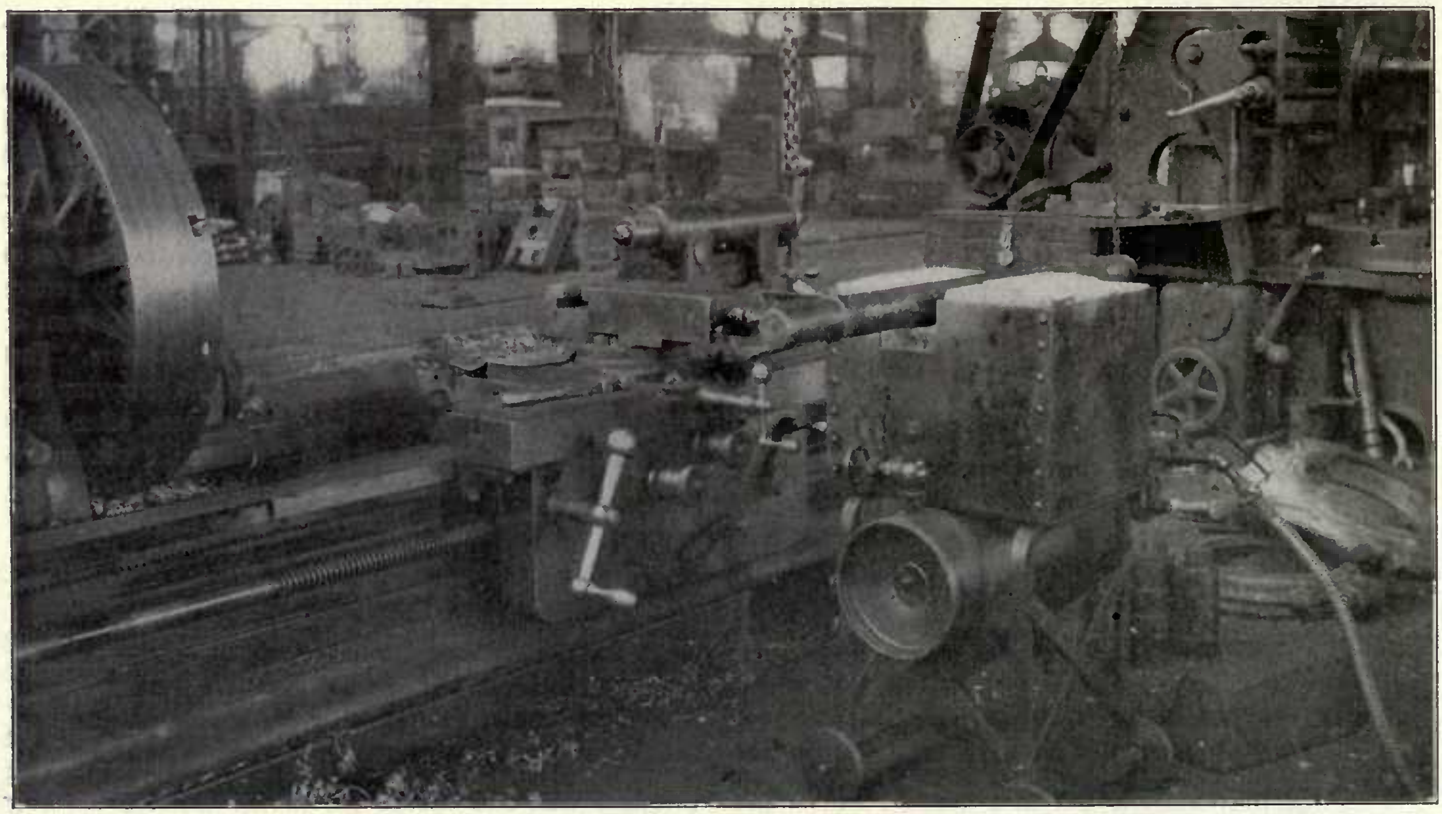


Fig. 139—Oil Furnace for Heating Piston Rods Preparatory to Straightening Them in Lathe Centers.

ing ring. The six jaws are held in place by the plate *F*, which is bolted to the face by six screw-head bolts. This chuck is accompanied by several sets of jaws in order to cover a wide range of diameters, the travel of any one set being only ½-in. If desired, the chuck can be made to fit into the sleeve of the live center of the lathe, which makes a carrying dog unnecessary. This chuck may also be used for turning steam pipe joint rings, by having a set of long jaws.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### PISTON ROD PACKING, MANUFACTURE OF

The devices in use for making metallic packing rings for piston rods and valve stems start with the molding of the rings and cover each successive step until they are

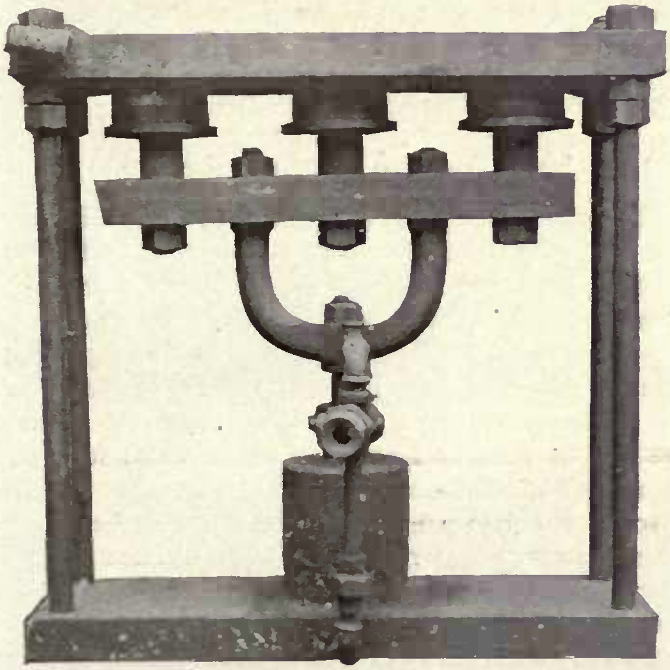


**Fig. 141—Molding Machine for Piston Rod Packing Rings.**

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,

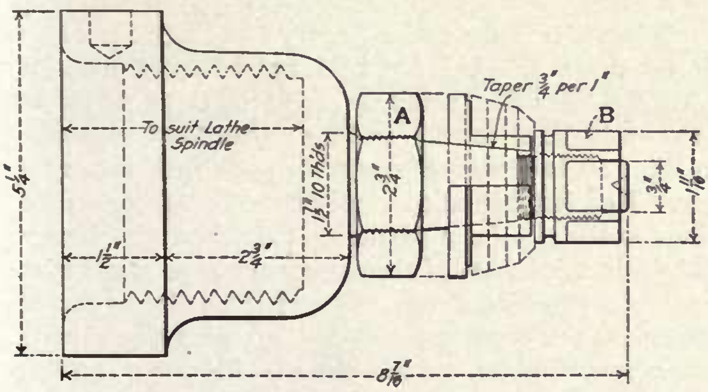



**Fig. 142.—Expanding Mandrel for Turning Piston Rod Packing.**

a photograph of which is reproduced in Fig. 141, 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 in place by the three stems that project down and are attached to the crossbar. This crossbar is moved up and down by the piston rod in the small cylinder at the

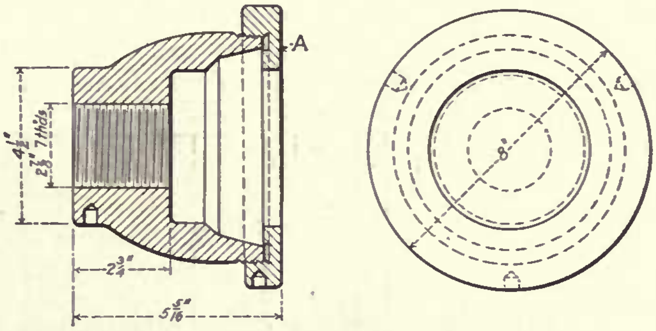



**Fig. 143—Chuck for Boring Packing Rings.**

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

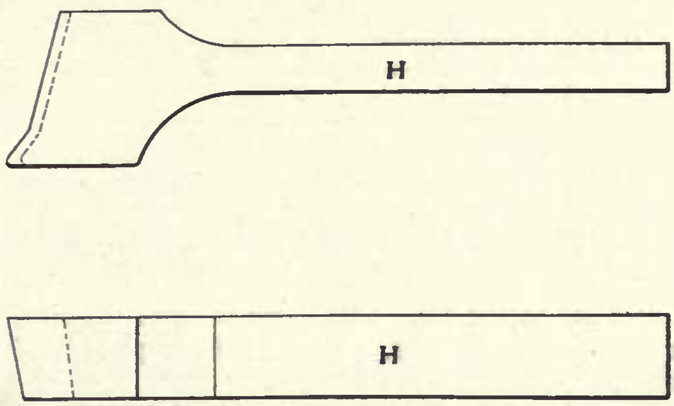



**Fig. 144—Tool for Forming Metallic Packing.**

cooled air is admitted to the upper end of the cylinder, the cores are pulled down and the rings are readily removed.

For turning the rings there is a special expanding man-

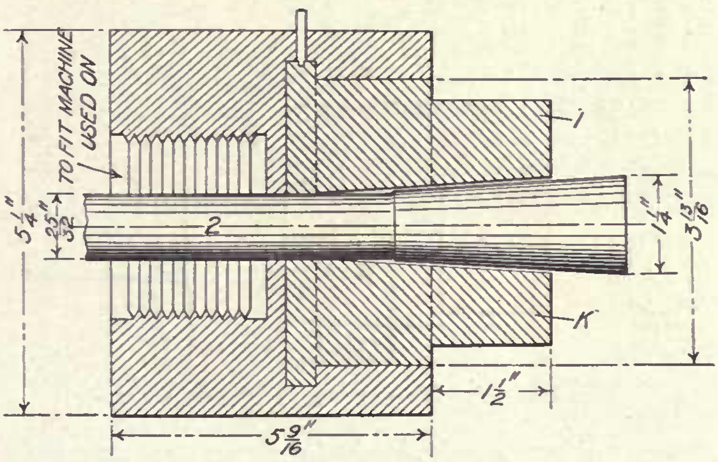



**Fig. 145—Metallic Packing Chuck.**

drel, Fig. 142, which is made to screw on the end of a lathe spindle in the place of the face plate. Beyond the hub in which the screw thread is cut 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 ring type cut to permit of being expanded as it is forced on 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 is drawn home. After

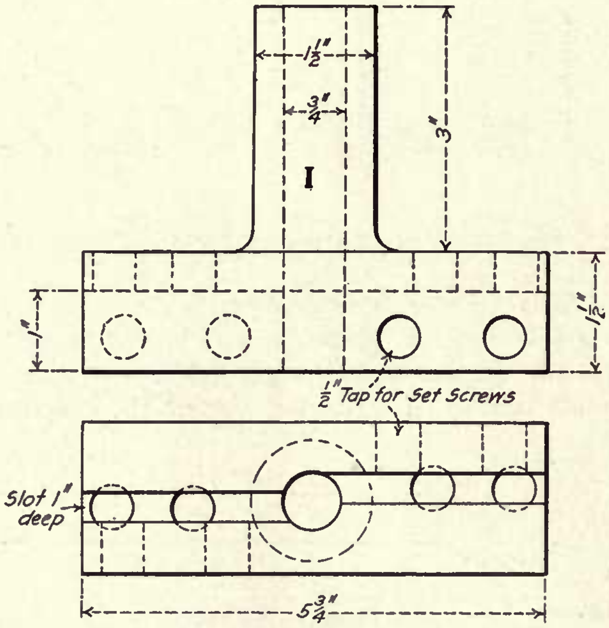



Fig. 146—Facing Tool for Metallic Packing.

turning, the expander is backed off by the nut *A*. Another chuck, Fig. 143, which screws on the lathe spindle, is used for boring out. This chuck is bored out on 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 in Fig. 144. It is held in the ordinary tool post and is simply fed against the ring as it turns in the chuck.

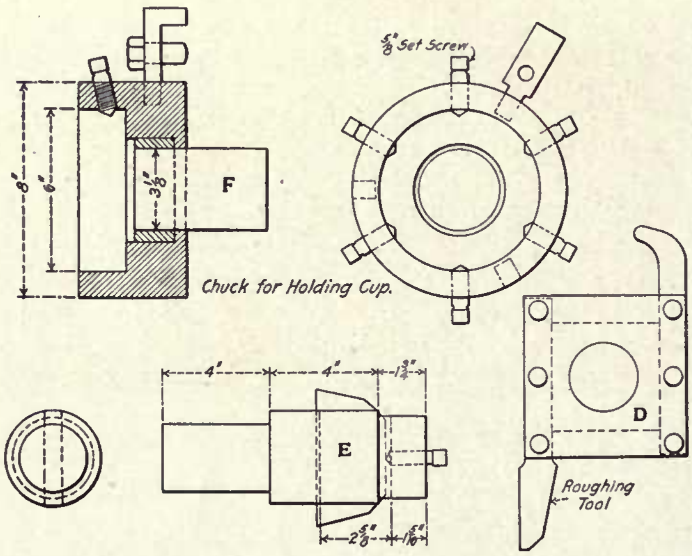



Fig. 147—Tool for Forming Vibrating Cups.

Another form of chuck is that shown in Fig. 145. It requires a lathe specially fitted to receive it, and this has been provided, an old turret lathe being used for the purpose. The body of the chuck is screwed on the spindle, which is hollow. The expanding rings (1) are set in this body and are bored 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 extends to the front of the lathe within easy reach of the operator. The movement of this handle is limited by stops, so that the mandrel cannot be thrown out too far. This makes the chucking of the ring an exceedingly rapid operation and leaves the outside and one end of it accessible for machining.

The tool for facing the rings with this chuck is shown in Fig. 146. It consists of a head carrying a flat-blade tool which is pushed against the ring.

The chuck and tools used for forming the vibrating cups are shown in Fig. 147. The stem of the chuck is made to fit the machine that is used, and the cup is held by the set-screws. The tool holder *D* is set on a vertical spindle and turns so as to bring either the roughing or boring tool into play. The inside of the cup is finished with the tool *E*.—*Delaware, Lackawanna & Western, Scranton, Pa.*

## PISTON ROD AND VALVE ROD PACKING.

The four photographs, Figs. 148, 149, 150 and 151, show the three processes of making the soft metal rings and that of handling the vibrating cups. The rings are cut from a cast bushing, using a gang tool and cutting off one set of three rings at a time as shown in Fig. 148. The bushings for piston rod packing are cast sufficiently long for cutting five sets of packing from each, while those for valve stem packing make six sets per bushing. The bushing is rough bored to a minimum rod diameter before the rings are cut. This rough size also suits the mandrel which is used in the second operation, that of forming. On top of the turret head is shown a number of cut rings, and on the pegs of the shelf above the machine are a number of sets of both cut rings and the finished packing.

Fig. 149 illustrates the second operation, that of forming the outside of the rings to the exact contour of the vibrating cup. A set of formed rings is shown in place on the mandrel and the forming tool is shown turned up so as to better illustrate its shape. The rings are a neat fit on the mandrel, being held by the large nut and washer. After this second operation the rings are placed in stock in the storeroom, and the third operation, shown in Fig. 150, is performed where the packing is drawn for use. This last operation consists merely of boring the rings to the size for a particular rod. The set of rings is held in a bushing, of the same contour as a vibrating cup, by a chucking sleeve. One of these sleeves is also shown on the turret top. It has a coarse thread with three interruptions, which permits its being quickly placed in the chucking bushing, as but one-sixth of a turn is necessary to lock it. This bushing checks the finished size of the packing rings, since the rings will not properly fit in it unless they are made of the correct size. A number of sets of finished rings are shown in front of the turret.

The method of machining the vibrating cups for this packing is shown in Fig. 151. Close inspection of the photograph shows the two tools—roughing and finishing—which are used. These are forming tools, the roughing one doing most of the work and the finishing tool being used only for a light finishing cut to the exact contour of the rings. The rough casting is held in the universal chuck as shown. The outside is turned off and then the inside is formed. The cup is then reversed in the chuck, the straight face is finished and the rough metal remaining on the outside diameter is turned off. Vibrating cups are placed in stock and bored out to fit the rod when used.

The Gibbs pattern of vibrating cup is used on piston rods with enlarged crosshead fit ends, a built-up cup being necessary. The brass portion of the cup is cast in halves. These are faced for joining, doweled, sweat together, machined and afterward broken apart. The machine work is done on the same lathe and with the same tools and chucks as used for the packing.—*Long Island Railroad, Morris Park, N. Y.*

PISTON ROD PACKING AND VIBRATING CUPS.

The shouldered piston rod is used on most of the locomotives of the Lehigh Valley, this being done to get a large crosshead fit. It necessitates the use of packing having a split vibrating cup, and the work of machining these cast-iron cups on a Gisholt turret lathe is of considerable interest. The first operation is shown in Fig. 152. The cup casting is made in halves and the edges which fit against each other are finished on a shaper before the turret lathe work begins. Stock is made the length of two vibrating cups. The illustration shows the first stage of the work completed, that of machining the outside of one cup. The snap gage used for this work is shown on the carriage of the machine. It will be noticed that a four-jaw chuck is used for this work. It was formerly performed with a three-jaw chuck, but it was necessary to drill and dowel the halves before putting them in the machine. This not only required time, but castings were very often ruined by having the small drills broken off in them.

The second operation is illustrated in Fig. 153. At the

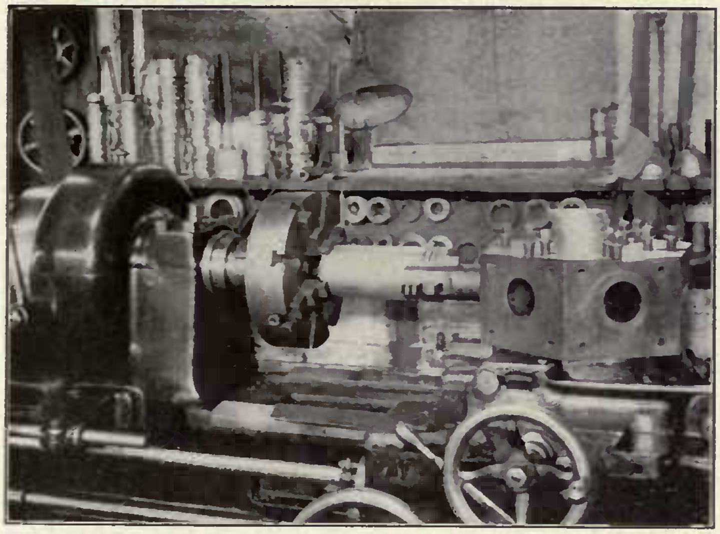


Fig. 148.

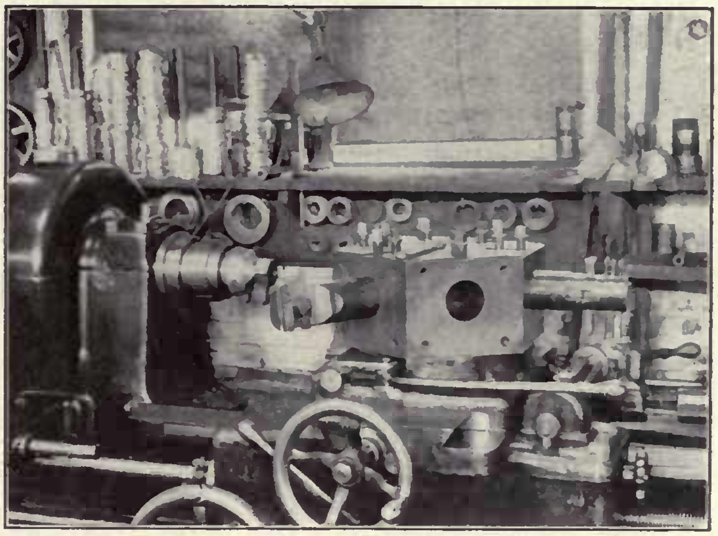


Fig. 149.

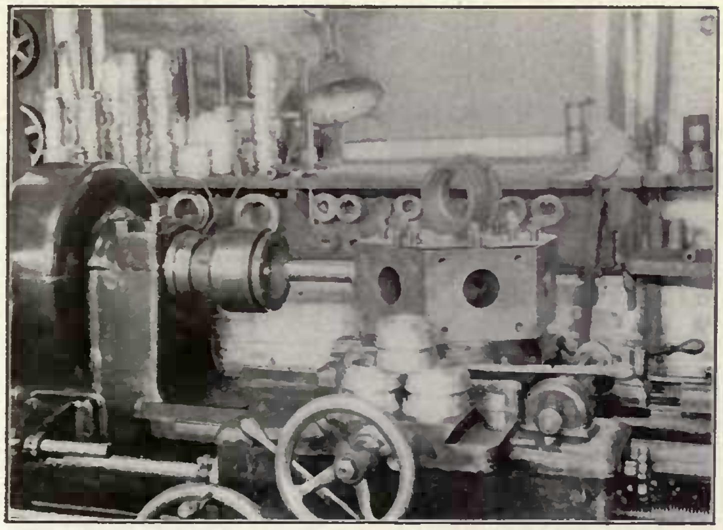


Fig. 150.

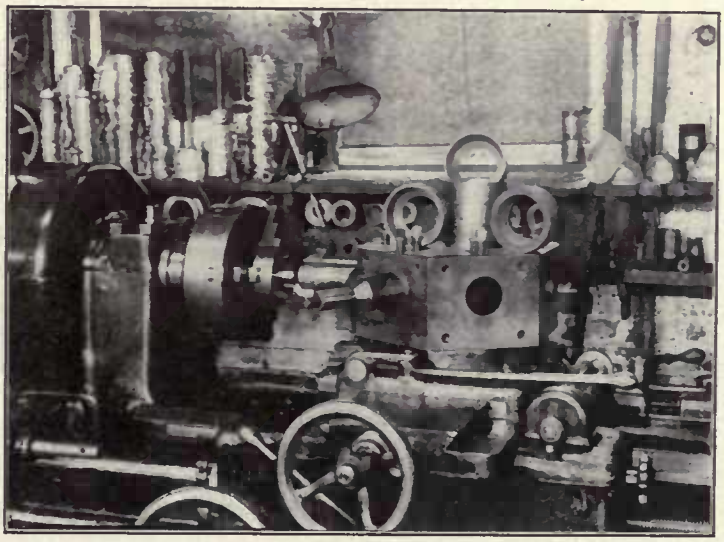


Fig. 151.

Manufacture of Piston and Valve Rod Packing.

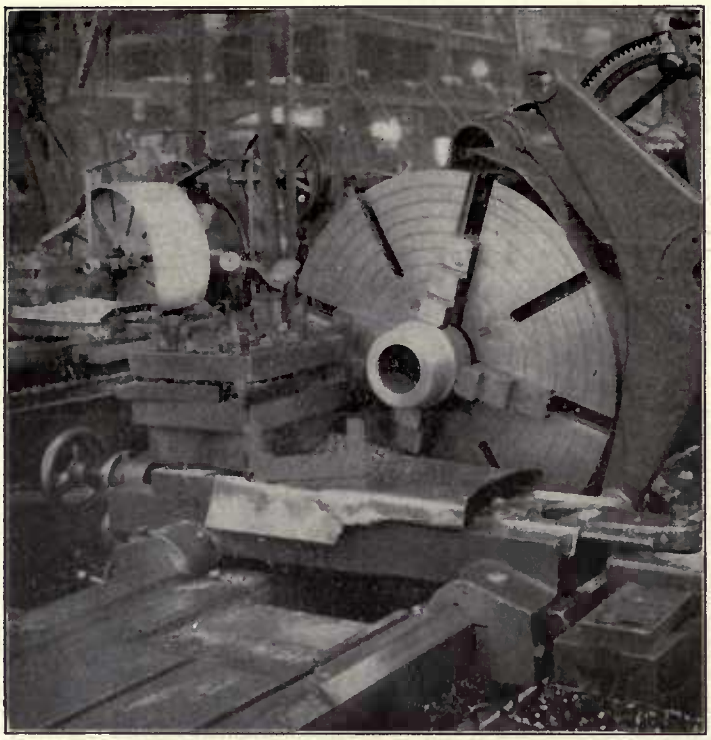


**Fig. 152—First Turret Lathe Operation in Finishing Two Part Piston Rod Vibrating Cups.**

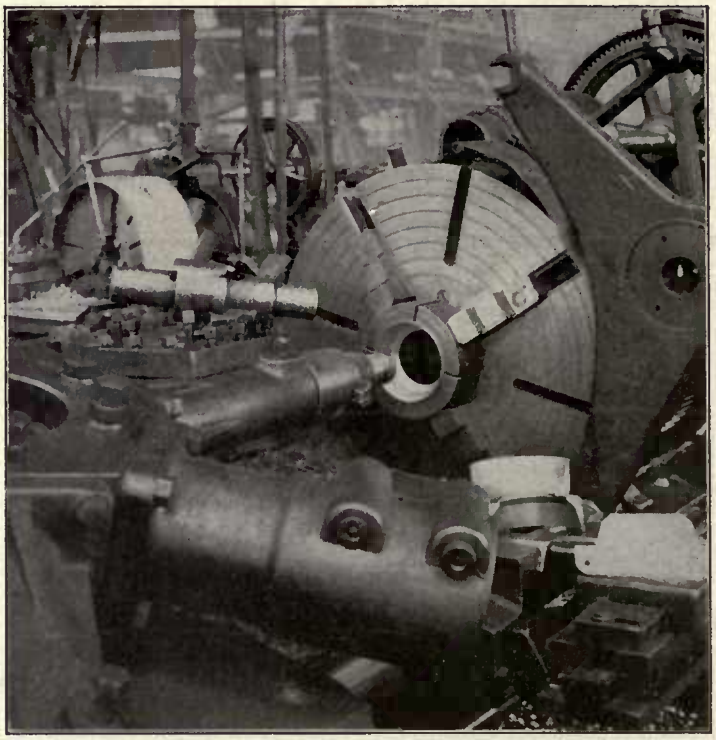


**Fig. 154—Finishing the Inside of the Two-Part Piston Rod Vibrating Cup.**

completion of the first operation, the chucking sleeve, shown in Fig. 153 is placed in the machine. The inside contour of this sleeve corresponds with the outside of the vibrating cup. The second cup is then machined to the snap gage and is cut from the one in the sleeve with a parting tool. The second photograph shows the cup just after it was cut off.

Fig 154 illustrates the operation in which the cup is machined on the inside. Still clamped in the split sleeve used in the previous operation, an ordinary roughing tool is used to cut away the sandy rough cast iron. Then two forming tools are used, the roughing one of which is shown on the tool turret, and the other in position in the turret. This shaping is done to the snap gage shown on the machine, near which are the halves of a finished cup.

This vibrating cup when in use fits into a brass vibrating cup, the bore of which is made large enough to slip

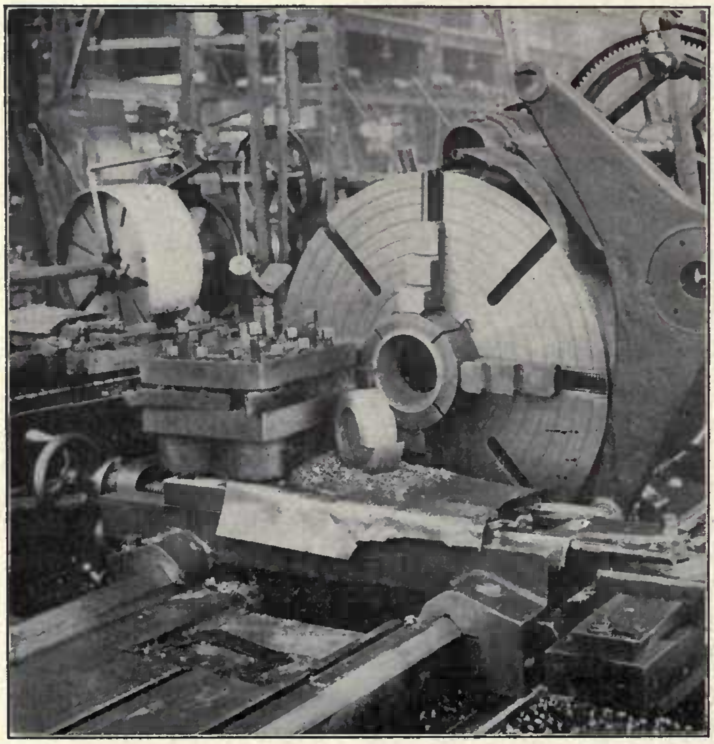


**Fig. 153—Second Vibrating Cup Completed on the Outside and Cut from the First One.**

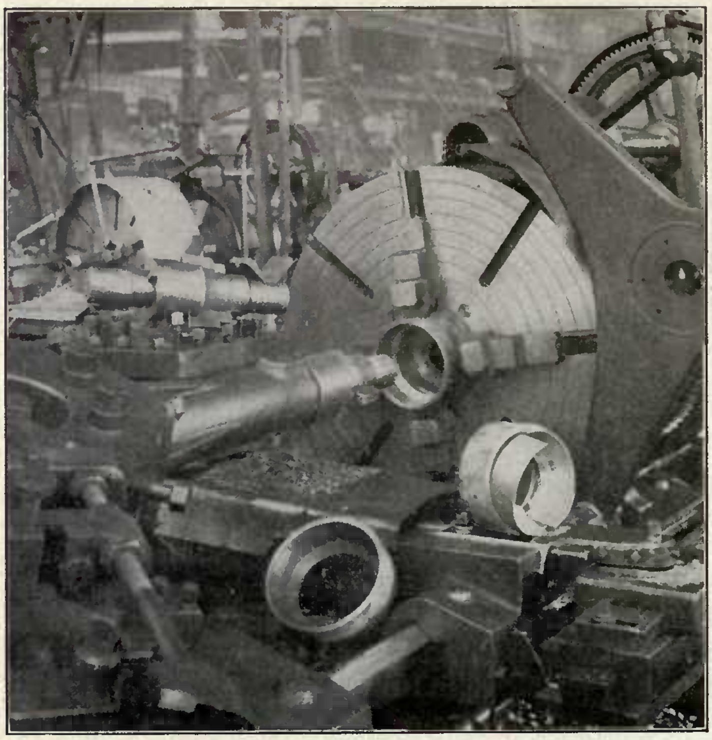


**Fig. 155—Finishing the Inside of the Large Brass Vibrating Cup in Which the Cast Iron Cup Fits.**

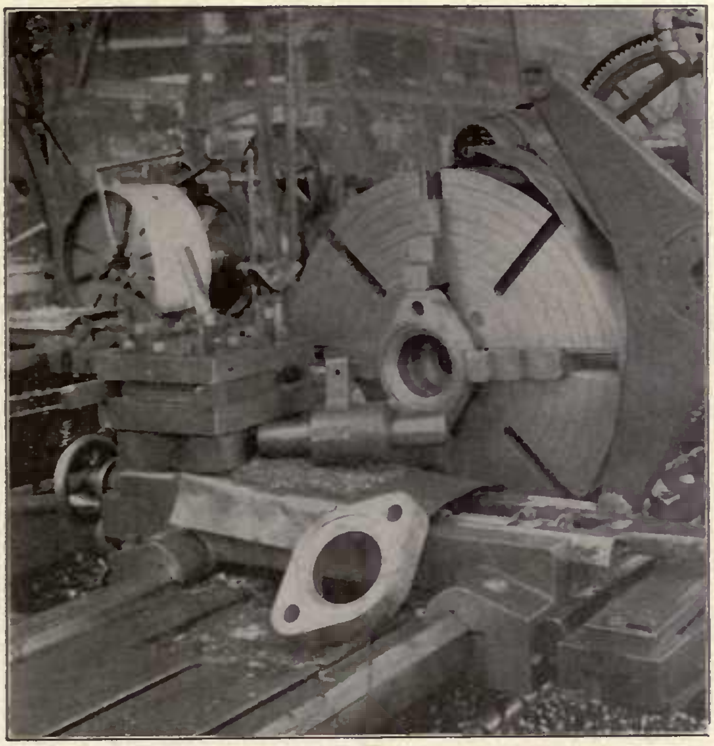


**Fig. 156—Tool With Five Cutters For Finishing Inside of Piston Rod Gland.**

over the shoulder of the piston rod. These brass cups are machined on the same turret lathe, being gripped in the four-jaw chuck, extension straps on the jaws, however, being necessary. The two forming tools used are shown in Fig. 155, as is a completed cup and a completed combination of the brass and cast iron cups as used on the locomotive.

An ingenuous tool for forming the inside face of the gland used with these vibrating cups is shown in front of the face plate, Fig. 156. The tool has five separate inserted cutters. The gland is, of course, first roughed out with a roughing tool.

The machine on which the soft metal packing rings are finished is shown in Fig. 157. In the foreground are shown the molds in which the packing rings are cast separate. Provision is made for casting 12 piston rod and six valve rod rings at one pouring. After the metal is poured, the cores are raised by the air cylinders, and the rings may be taken off to cool. Each ring is faced separately and then a set of three is put on the expanding mandrel and finished to exact size and contour, using a broad forming tool. The spindle is equipped with a friction clutch, which is thrown in by the lever seen just over the work. This provides for rapid starting and stopping. On the floor is shown one of several boards that fit neatly into boxes in which finished packing rings are shipped to various points on the road.—*Lehigh Valley, Sayre, Pa.*

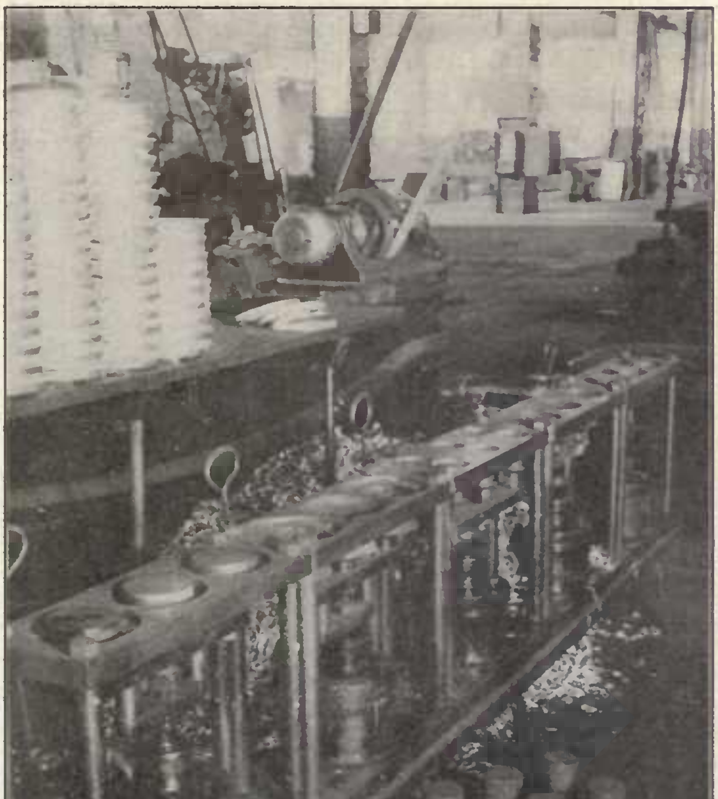


**Fig. 157—Molds for Pouring and Machine for Finishing Piston and Valve Rod Packing Rings.**

PISTON VALVE BUSHINGS, SLOTTING.

The cutting of the diagonal ports in bushings for piston valves is a slow process at best and usually requires considerable filing after it is completed. By the use of an angular cutting edge on the broaching tool shown in Fig. 159, most of the diagonal ports can be finished on the small shaper. The photograph, Fig. 158, illustrates the manner in which the bushing is chucked on the shaper and the drawing shows the shape of the broaching cut-

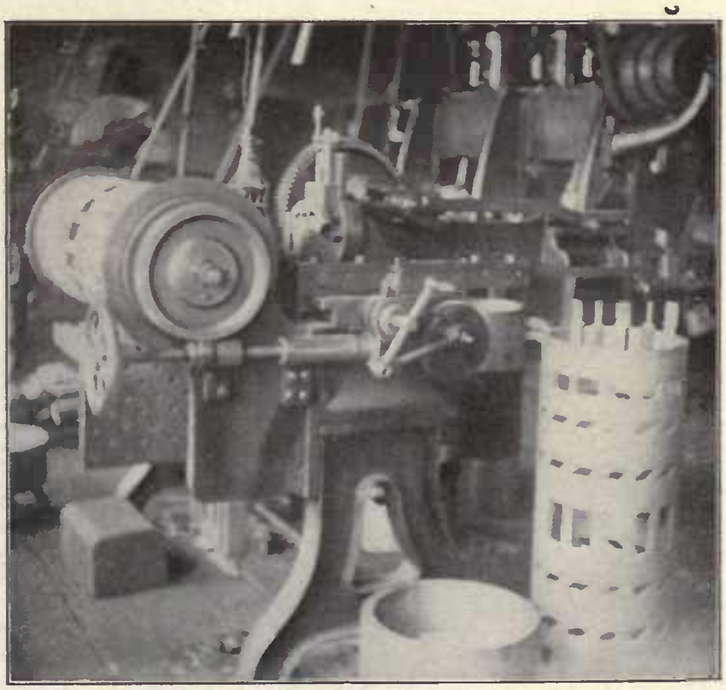


**Fig. 158—Shaper Using Special Tool on Valve Bushing.**

ter. The old method of slotting these ports required 8 to 10 hours, but by this improvement the work can be

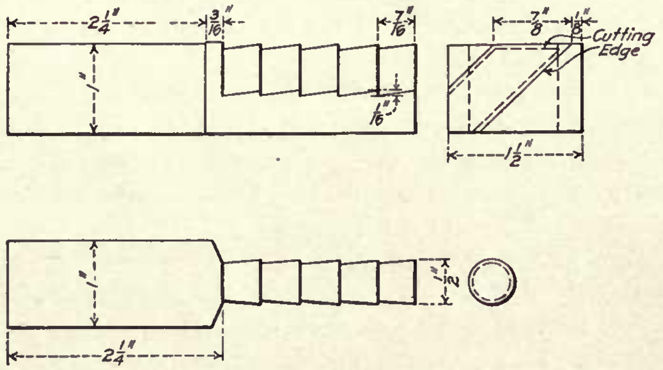



Fig. 159—Tool for Cutting Ports in Piston Valve Bushings.

done in 4 hours.—*Chicago, Milwaukee & St. Paul, West Milwaukee, Wis.*

PLANER TOOL BAR.

A double tool holder used principally for finishing shoes and wedges is shown in Fig. 160. The tool blocks inserted in the end of the holder are pivoted on the ⅜-in. pin and are held in position by the spring shown. Both sides of the frame fit of the shoes and wedges are finished at the same time. The spring arrangement provides release for all reverse movements. This tool has been successfully used in these shops for several years. —*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

PISTON VALVE CHAMBER, BORING.

A traveling head set on a boring bar for boring piston valve chambers and which is moved along it by a screw

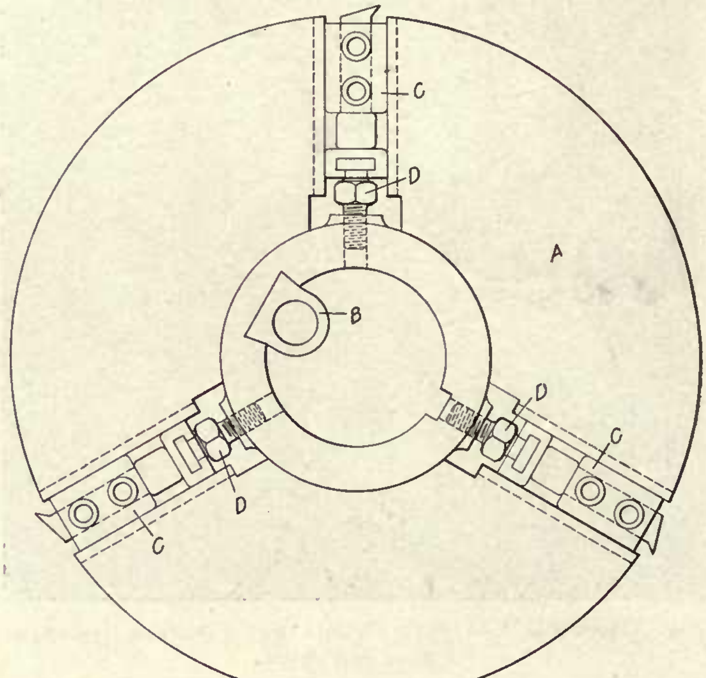



Fig. 161—Tool Head for Boring Piston Valve Chambers.

feed is shown in Fig. 161. 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 suit

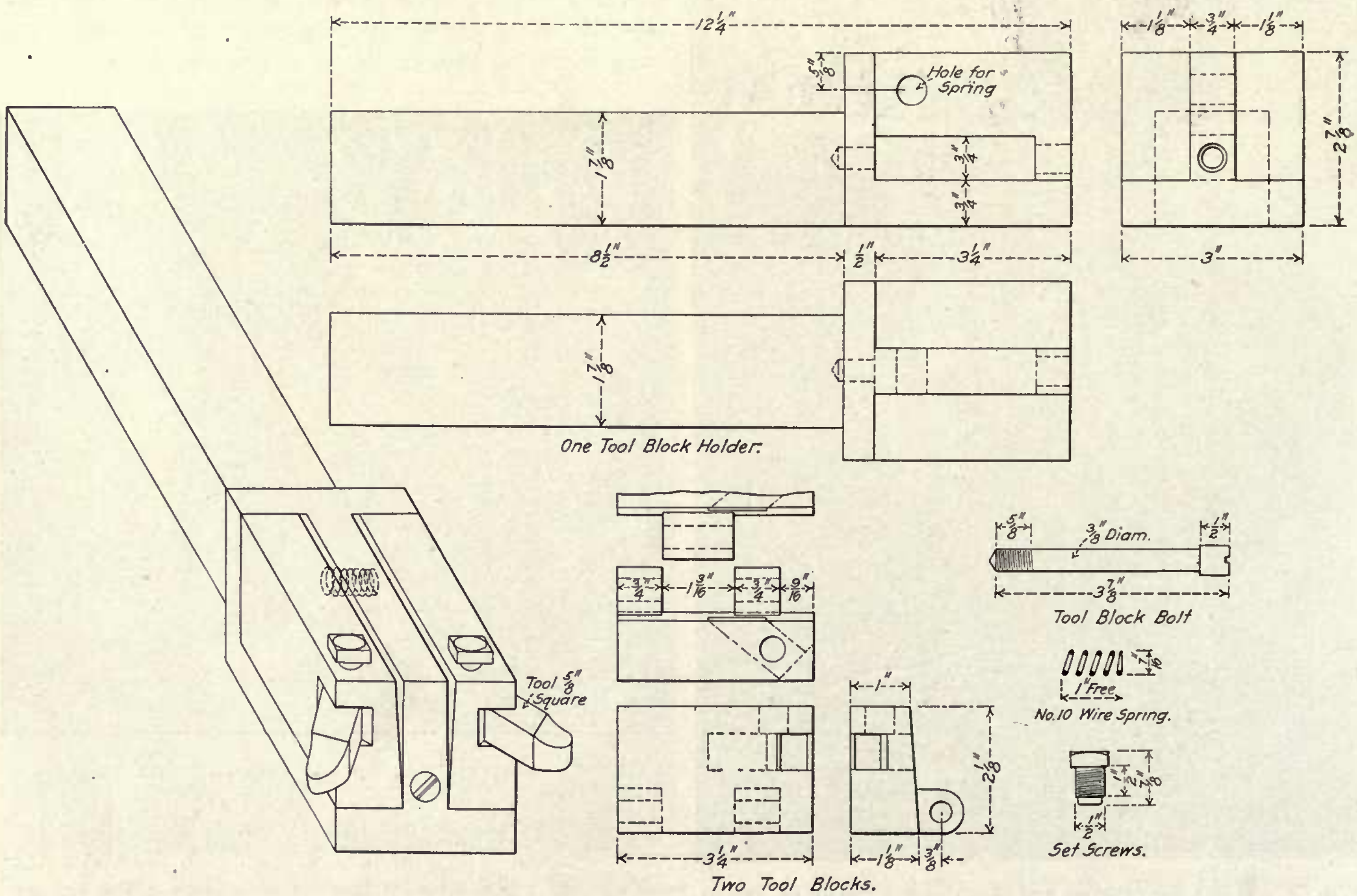



Fig. 160—Double Tool Holder for Planer.

that of the chamber. It is bored and key-seated to fit a 3-in. boring bar and its spline. Opposite the key-seat is another and broader one, dove-tailed to take the feed nut *B*. The tool-holders *C* are set in T slots cut in the

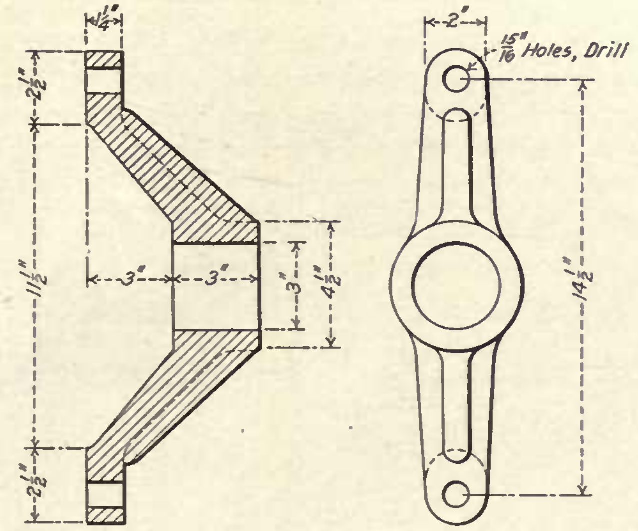



Fig. 162—Guide Head for Boring Piston Valve Chambers.

face of the disk, and are adjusted by the screws *D*, which are threaded radially into the hub, and have a head that fits the tee in the tool-holder. At the ends of the valve chambers the bar is held by guide-heads, Fig. 162, bolted fast by means of the valve chamber head studs.—*Delaware, Lackawanna & Western, Scranton, Pa.*

PLANER STOP.

The usual practice in planer stops is to drive tapered plugs in the cast openings in the planer bed. This arrangement makes a good, steady stop, but the repeated driving in and drawing of the tapered plug results in knocking off the corners of the openings, making an

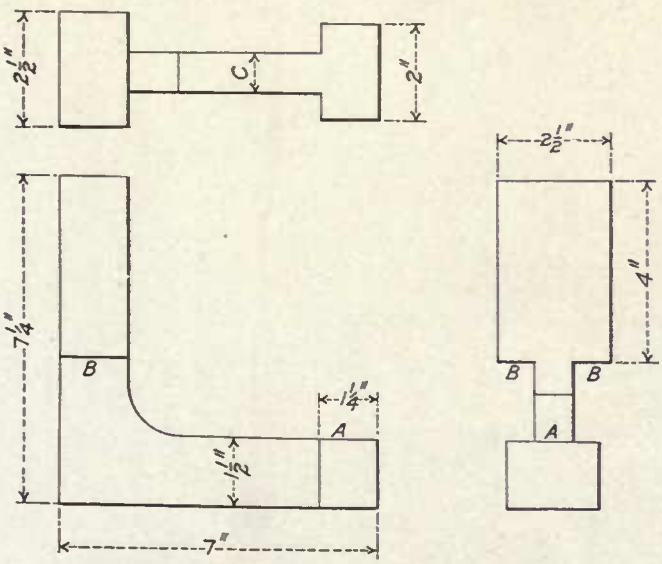



Fig. 163—Planer Stop.

unsightly planer bed. The stop shown in Fig. 163 may be made of cast or wrought iron. The side elevation shows the position which it assumes when being used. The surface *A* bears against the top of the T slot, while the shoulders at *B* rest on the top surface of the planer bed. The dimension *C* is made slightly less than the width of the slots in the bed plate.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

PLANER, TURRET TOOL HEAD FOR.

The application of an inexpensive turret tool head to a small planer is shown in Figs. 164 and 165. It was primarily made to reduce the time of planing shoes and

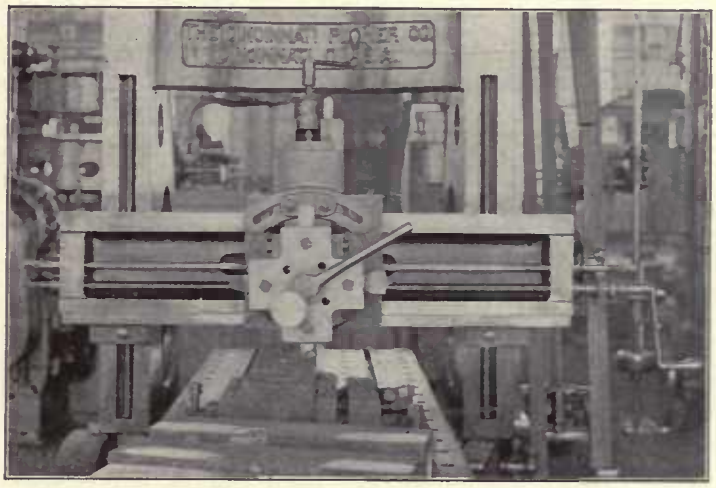


Fig. 164—Turret Tool Head Applied to a Small Planer.

wedges, there being three tools for each shoe. However, it has since proved adaptable to the general run of work and is a good time and labor saving device. The tool head is bolted to the clapper *E* and turns on the pin *B*;

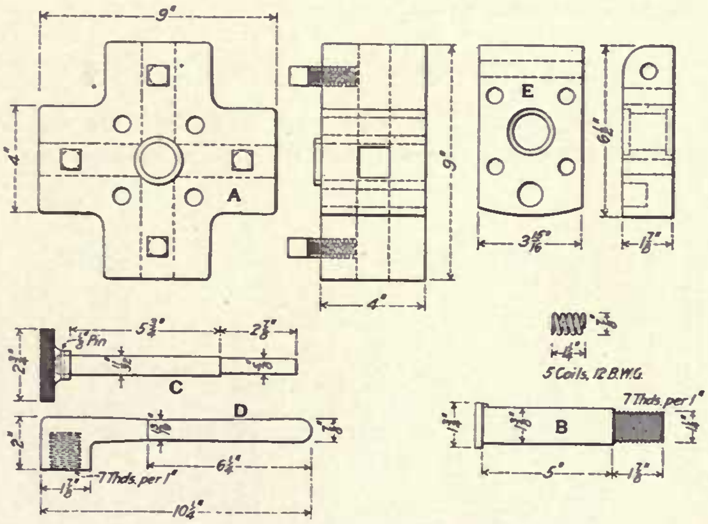



Fig. 165—Details of Turret Tool Head for Planer.

it is centered by the pin *C* and is clamped in position by the hand nut *D*.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

PLANER TOOL BAR.

The planer tool bar shown in Fig. 166 was designed to overcome the necessity of resetting a planer tool on the clapper plate when changing the direction of cut. It is also useful in permitting the use of small tool steel cutters.

The cutter is held in position by the bolt, through the head of which it passes. The cutter may be easily and

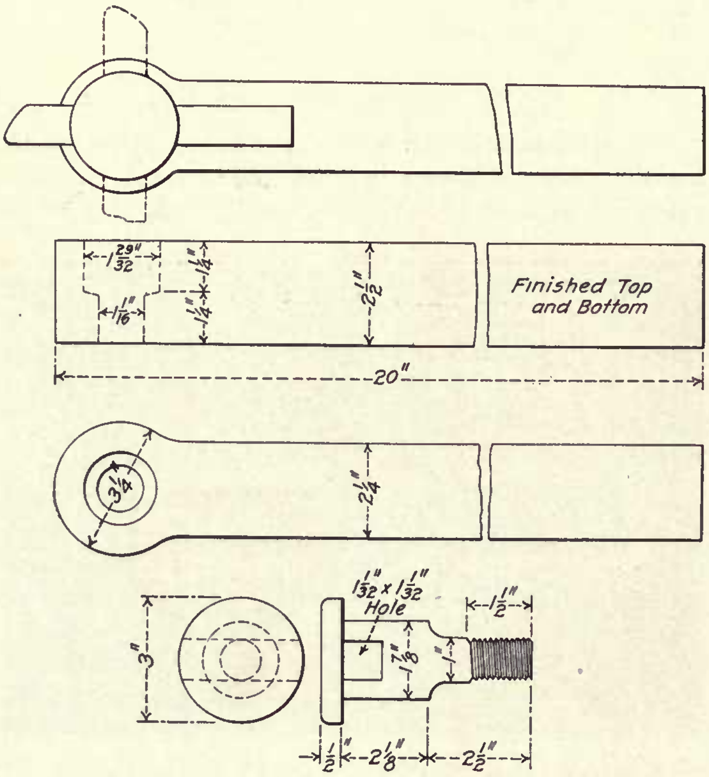



Fig. 166—Planer Tool Bar.

quickly changed or turned to any angle, which adjustment is much more easy and rapid than readjusting the tool at the clapper plate. The bar is finished on its top and bottom surfaces.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

PLANER TOOL BAR.

A double planer tool holder for machining the inside faces of the flanges of shoes and wedges, driving boxes,

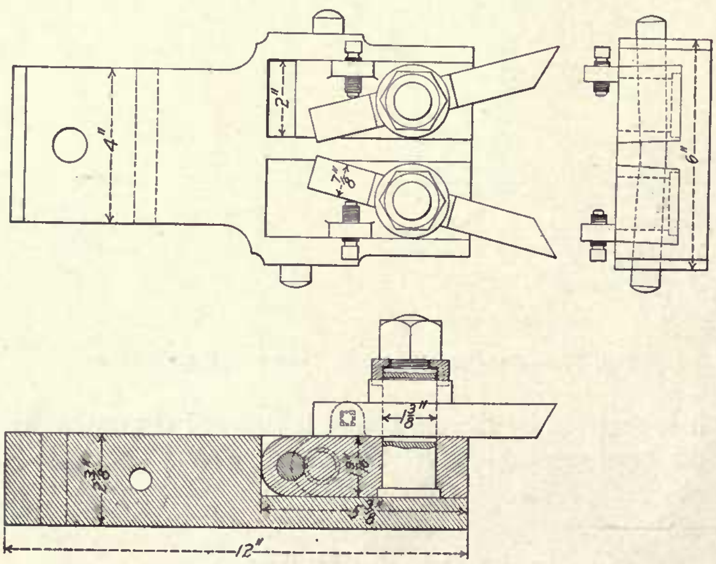


Fig. 167—Planer Tool Holder.

cross-head gibs, etc., is shown in Fig. 167. The tools are inserted through slots in the bolts and are drawn down tightly against the clapper plates and adjusted by the small set screws.—*William G. Reyer, General Foreman and J. W. Hooten, Foreman Repair Work, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

REACH ROD END SLOTTING TOOL.

The gang slotting tool shown in Figs. 168 and 169 was specially made for reducing the labor cost on new locomo-

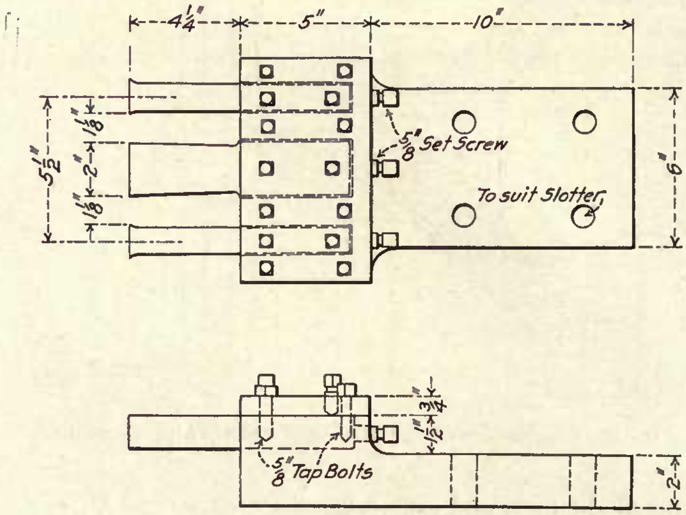



Fig. 168—Reach Rod End Slotting Tool.

tives. A hundred or more jaws were ordered at one time, and finished in large lots. Under the old method of slotting with a single tool, it required two hours per jaw.

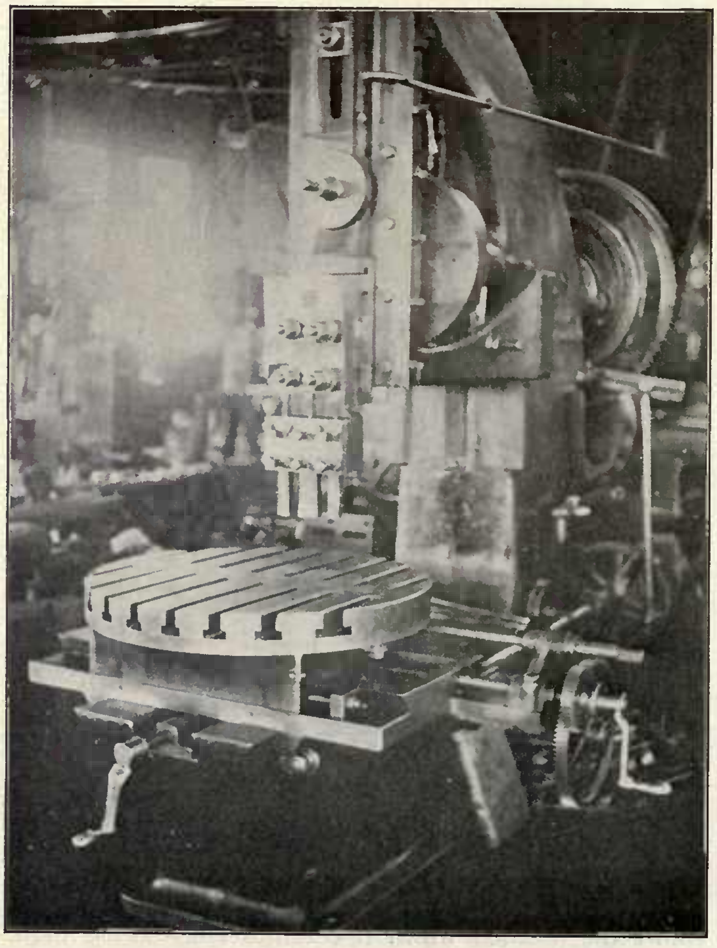


Fig. 169—Reach Rod End Slotting Tool on Machine.

With the gang tool having three cutters, the central portion and the two outside faces are finished at one operation, the time required being only 35 minutes.—*Chicago, Milwaukee & St. Paul, West Milwaukee, Wis.*

### REAMER, DETACHABLE.

The detachable reamer (Fig. 170) was especially designed to eliminate breaking and warping of ordinary shell reamers when the finished tool is tempered. A saving in tool steel can also be effected, as one shank may be used for a large number of reamers. The small block

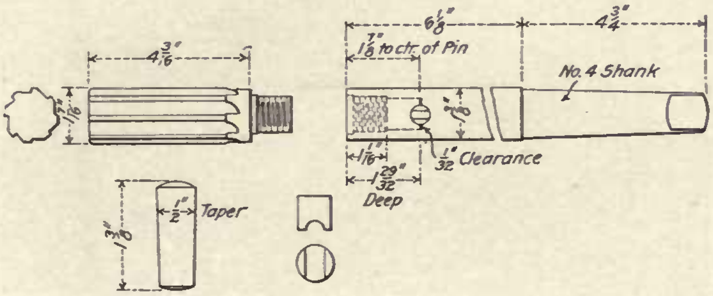



Fig. 170—Detachable Reamer.

shown in the illustration acts as a lock in holding the reamer in the shank, as it is driven against the threaded end of the reamer by the taper key. A clearance of 1/32 in. is provided between the end of the block and the shank.—*Fred Bentz, Tool Room Foreman, Southern Pacific, Bakersfield, Cal.*

### REAMERS.

Several reamers and shanks are shown in group *J*, Fig. 171, which illustrates an idea of standardizing the holes in special reamers so that spindles or shanks may be made to fit into the various styles of machines that may have occasion to use them.

The reamer on the right of group *K*, Fig. 171, has been found to be an improvement over the other two as the flutes are not as near together and there is more room for the chips to free themselves and work out of the hole. Under severe tests this reamer has not broken a flute.

### BRASS WORK, LATHE TOOLS FOR.

An economical design of lathe tools for brass work is shown in group *O*, Fig. 171. Each tool has a seat for the set screw located by a jig so that it will fit the shank properly and run true with the spindle of the lathe. This is much cheaper and more satisfactory than the solid tools used in some shops.

### THREADING TOOL.

A threading tool is shown at *N*, Fig. 171, and in detail in Fig. 172. It is only necessary to grind the top face to keep it sharp. It is milled by the cutters *M*, which in turn are made by feeding the chaser *L* into the cutter in the lathe forming a series of angular grooves of the desired pitch and depth. One of these cutters has threaded 14,000 mud plugs and used up 1¼ in. of the cutter.—*M. H. Westbrook, Grand Trunk.*

### REAMER, ADJUSTABLE.

An adjustable reamer, used in connection with the manufacture of 2-in. pneumatic blow-off cocks, is shown in Fig. 173. There are 12 removable cutters *A*, which are adjusted to the correct diameter after grinding and

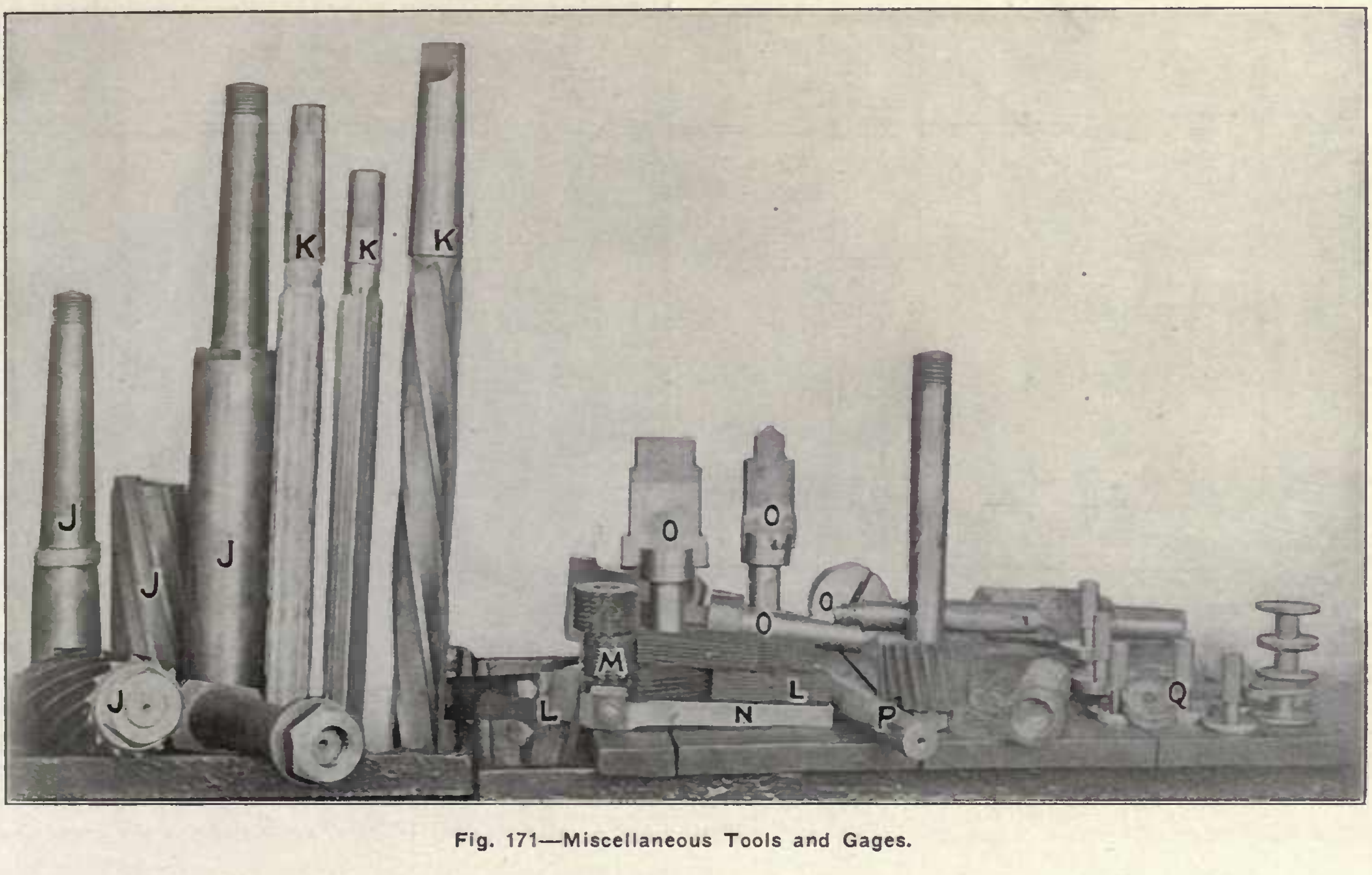



Fig. 171—Miscellaneous Tools and Gages.

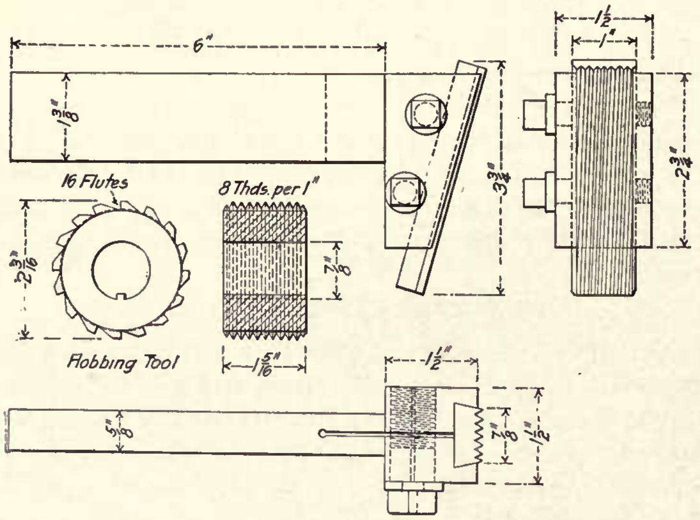



Fig. 172—Threading Tool.

are held tight by the taper collar *B* and the nut *C*. One of the cutting blades is shown in Fig. 174. These are

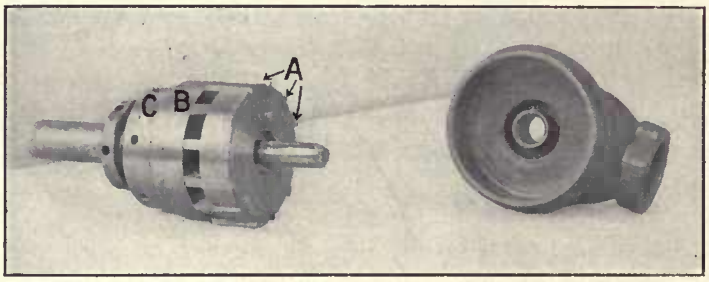



Fig. 173—Adjustable Reamer for Pneumatic Blok-Off Cocks.

made to fit tightly in equally spaced slots in the 4 1-16 in. head. The taper collar forces them against the taper

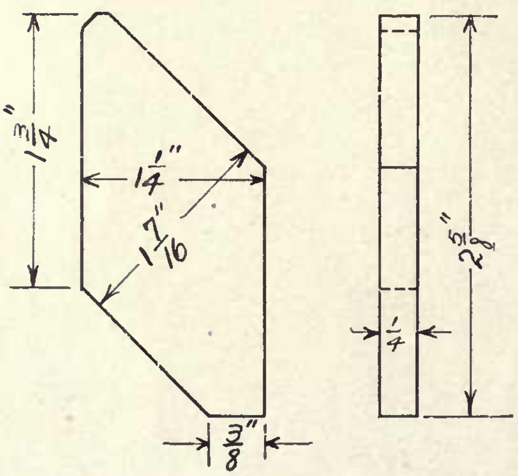


Fig. 174—Cutting Blade for Adjustable Reamer.

head, holding them securely. The blades may easily be removed for regrinding.—*Chicago & North Western, Chicago.*

AIR PUMP GAGES.

A set of piston and ring gages for air pumps and piston packing rings are shown in group *Q*, Fig. 171. The gages in each set vary by 1/32 in.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

REAMERS, SOCKET FOR TAPER.

A socket for holding taper reamers is shown in Fig. 175, group *A*. This has proved of value in reaming

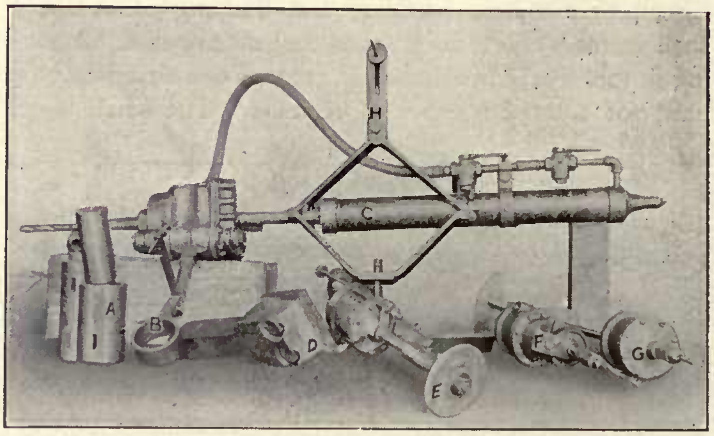



Fig. 175—Miscellaneous Tools and Handy Devices.

main rod ends and straps. The absence of the positive rigidity, found in the solid socket and spindle, allows the holes to be reamed faster and with less breakages.

REAMERS, GANG CHUCK FOR MILLING.

A special gang chuck used for milling four reamers at the same time is shown in Fig. 176. It is bolted to the

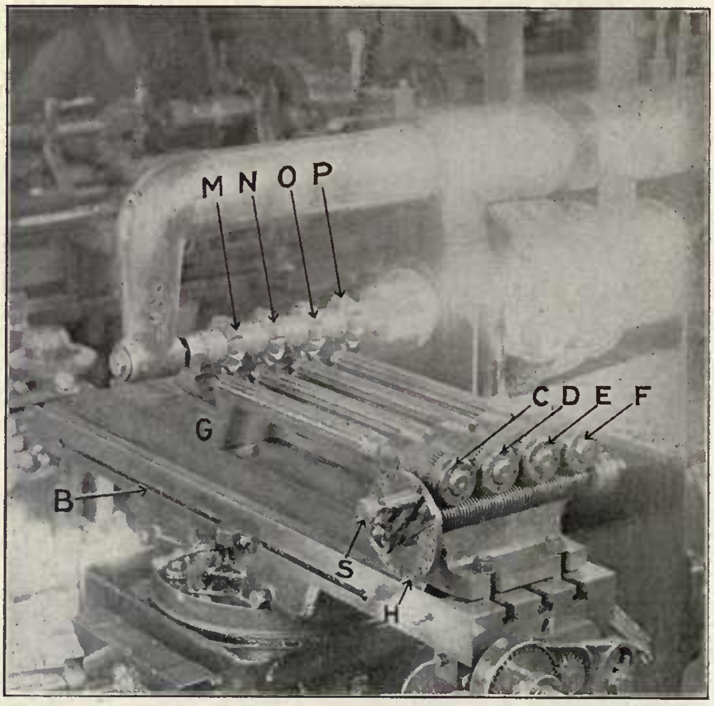



Fig. 176—Gang Chuck for Milling Four Reamers at One Time.

table *B*, and the reamers are inserted in the individual chucks *C*, *D*, *E* and *F*. The gang tail-stock is brought up as shown, and the reamers are fed into the four cutters *M*, *N*, *O* and *P*. The chuck is equipped with a spacing head *H*, and all four reamers are spaced at the same time by the movement of the handle *S.—Chicago & North Western, Chicago.*

QUARTERING MACHINE GAGE.

A quartering machine gage, *B,* is shown in Fig. 175.

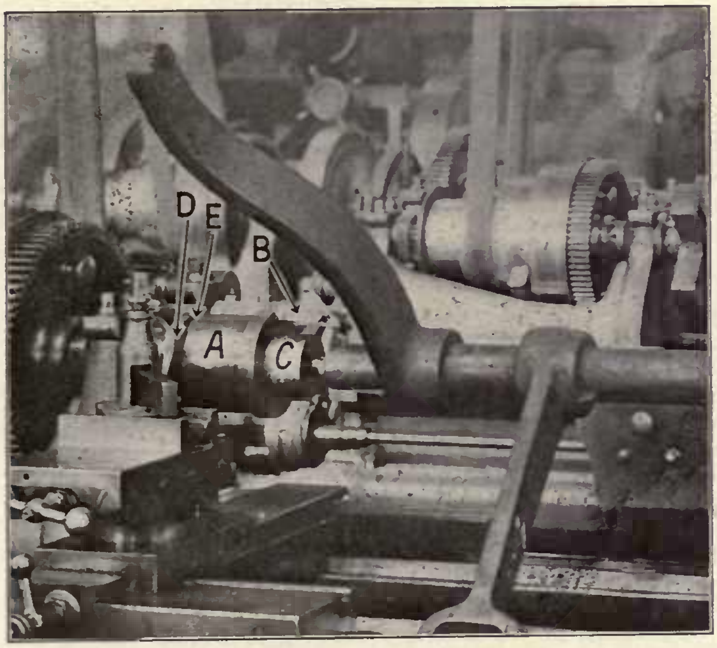



**Fig. 177—Tool for Turning Reverse Shafts Journals.**

It is slipped over the spindle and used to true up the crank pin preparatory to boring out the opposite wheel for a new crank pin.

CROSSHEAD SHOES, PLANING BABBITTED.

A tool for planing babbitted crosshead shoes in one cut is shown at *D* in Fig. 175. It has been made to cut better by having the cutting edges beveled back slightly.

QUARTERING INDICATOR.

The quartering indicator, *H* in Fig. 175, has proved valuable when pressing axles into driving wheels that have the crank pins already in.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

REVERSE SHAFT JOURNALS, TURNING.

A special tool for turning reverse shafts is shown in Fig. 177. It consists of a brass sleeve *A* to which the tool *B* is bolted. This revolves about the shaft *C,* which is screwed on the spindle of the lathe. The tool is fed by means of the carriage and the plate *D,* which is fitted in the groove *E* at the left on the sleeve, and is held in the tool post.—*Chicago & North Western, Chicago.*

REVERSE SHAFT JOURNALS, TURNING.

With the design of reverse shaft shown in Fig. 178, it is impossible to machine the bearing and use the regular tool slide-rest, unless a long tool be used so that the tool rest will clear the heavy arm at the center of the shaft. A tool of this length would not have the necessary stability for even light cuts, and the arrangement would be generally unsatisfactory. To overcome these difficulties, and to provide an arrangement by which both

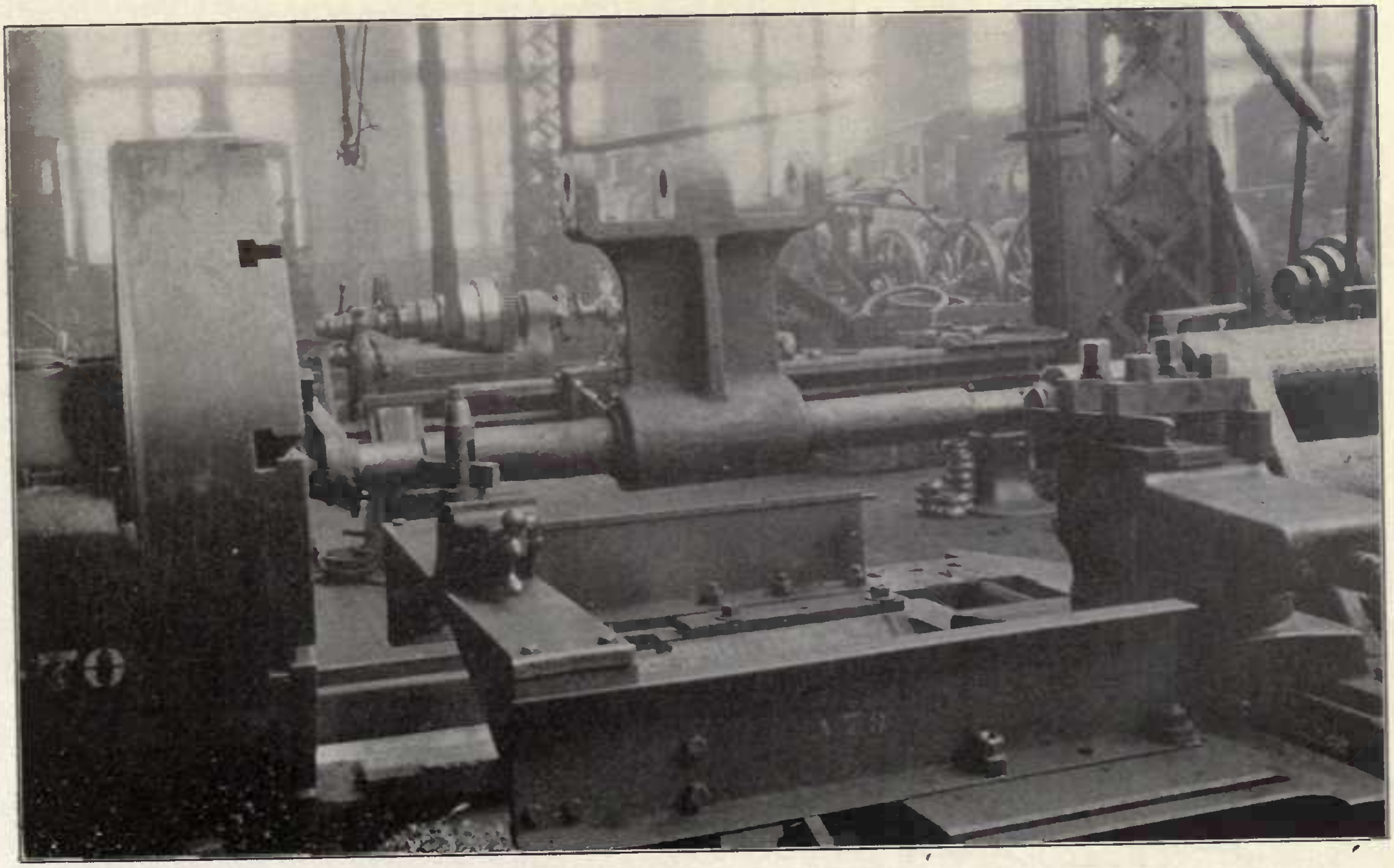


**Fig. 178—Pond Lathe Fitted for Truing Bearings on Reverse Shaft.**

bearings may be machined simultaneously, the extension tool-slide was designed. The two I-beams are bolted to the carriage of the machine. A rigid cross-bearer extends between the ends of the I-beams, to which it is securely braced. The illustration shows clearly how the work is done, the two tools being set for starting the cuts.—*Lehigh Valley, Sayre, Pa.*

REVERSE SHAFT JOURNALS, TURNING.

Reverse shafts are difficult to turn in a lathe using a stationary tool, even if the lathe has sufficient swing, and it has been found to be better to hold the work and revolve the tool. A simple arrangement of this sort, shown in Fig. 179, 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 mandrel and is prevented from turning by a key. The face of this sleeve carries a turning tool. The lifting shaft is then supported on the 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

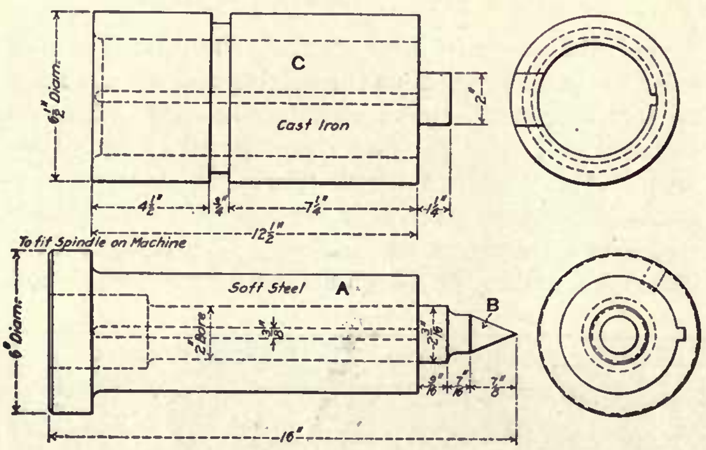



Fig. 179—Tool for Turning Reverse Shaft Ends.

sleeve with its spindle. These are then fed out over the work by a bar held in the tool-post in the ordinary way and pressing against the left side of the groove in the sleeve.—*Delaware, Lackawanna & Western, Scranton, Pa.*

REVERSE SHAFT JOURNALS, TURNING.

A tool for turning the ends of shafts with arms too long to swing in the lathe is shown in Fig. 180. The shank *X* is made to fit in the spindle. The yoke *A* can be made to suit any tool post, and the end for the tool *E*

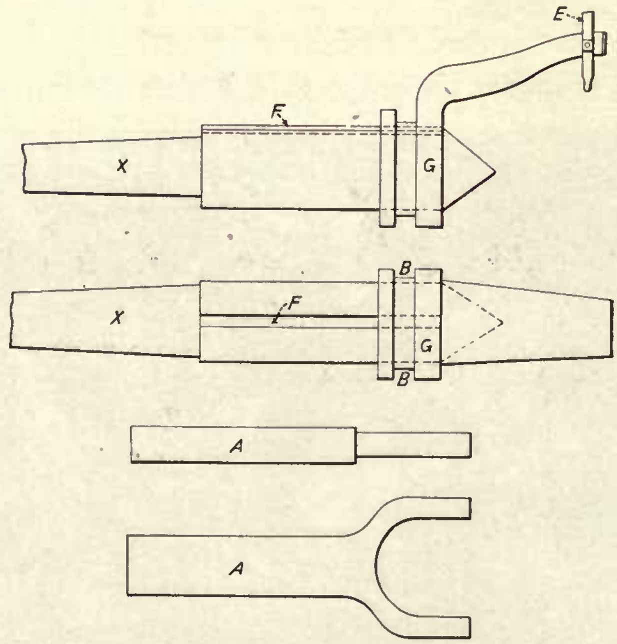



Fig. 180—Tool for Turning the Ends of Shafts.

can be made to take the standard size tool steel. A key *F* is fastened in the center, as shown, and a key-way is put in the sliding head *G* so it will turn with the center. The head *G* should be a neat sliding fit on the center and the key. The yoke *A* should fit the groove *BB* snugly. When the yoke is fastened in the tool post the feed can be put on in the usual way.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

REVERSE SHAFT JOURNALS, TURNING.

Because of the long arms on locomotive reverse shafts it is impossible to swing them in an ordinary engine lathe. Wheel lathes are sometimes used to perform this job, but the journals are usually filed to as near round as possible. The tool here illustrated, Fig. 181, is in constant use in one of the Northern Pacific shops, and is giving good satisfaction both in quality of the work and in time. The stem *C* is screwed to the spindle of the lathe after the face plate has been removed. The sleeve *B* is a sliding fit on *C* but is kept from turning by the key. The center fits into the hole shown in the end of stem *C*.

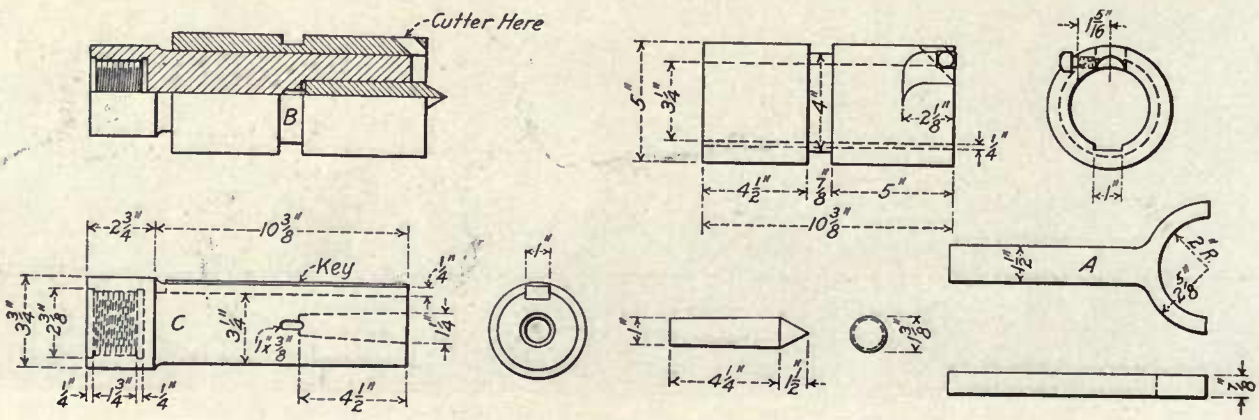



Fig. 181—Tool for Turning Reverse Shaft Journals.

The fork *A* goes in the tool post, the curved end fitting to the groove in sleeve *B*. The tumbling shaft to be turned is placed between the centers and clamped solid. A cutter is put in, as indicated, and is adjusted to take just enough off the journal to turn it up true. The lathe is then started. The spindle *C* turns the sleeve *B* and the feed screw carries the carriage ahead, thus moving the cutter over the length of the journal.—*F. A. Dailey, Northern Pacific, St. Paul, Minn.*

ROCKER ARM BOSS AND SOLID OIL CUP TURNING TOOL.

The tool shown in Fig. 182 is used for turning rocker arm bosses or the outside of oil cups which are forged integral with the rod. The end *A*, or top of the tool, is

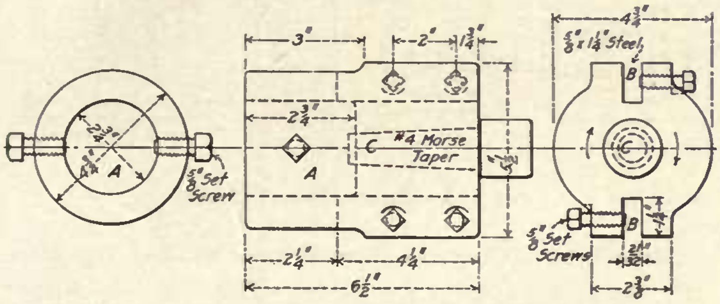


**Fig. 182—Rocker Arm Boss and Solid Oil Cup Turning Tool.**

bored to fit the drill press spindle to which it is secured by two ⅝-in. steel set screws. The slots *BB* are made to receive the cutting tools of ⅝-in. x 1¼-in. high-speed steel; these are secured by ⅝-in. set screws. The hole *C* is made to fit the No. 4 Morse taper of the plugs, the diameter of the projecting end of which varies according to the size of the pin hole in the rocker arm or the inside diameter of the oil cup. This projecting end steadies the tool and in case the rocker arm boss does not have a hole bored in it must, of course, be left out. —*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

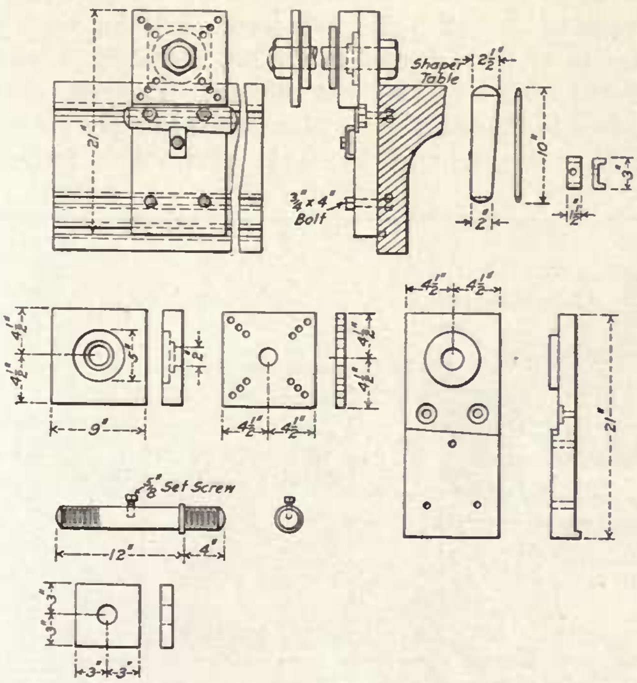


**Fig. 183—Chuck for Shaping Rod Brasses.**

ROD BRASS CHUCK.

A chuck for machining rod brasses on a shaper is shown in the assembled and detail drawings, Fig. 183. The chuck is secured to the side of the shaper table by four ¾-in. x 4-in. bolts, the heads of which fit in the T-slots in the shaper table. The brass is held between the two 9-in. x 9-in. plates which are drawn tightly together by the 2-in. nut on the stud which is secured to the back of the chuck. The lower portion of this back plate is made to fit the shaper on which the chuck is to be used, the ¾-in. x ¾-in. lip fitting in a T-slot below the one used for the lower bolts. The 10-in. taper key is driven in under the rear clamping plate and along the seat shown and is then secured against loosening by the small keeper. The front clamping plate is provided with 12 tapped holes for ¼-in. set screws which assist in holding the brass between the plates. A ⅝-in. set screw in the 2-in. pin, or stud, provides a means for holding the brass in position while clamping. This set screw is set up against the lower side of the brass.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

ROD BRASS CHUCK.

A special chuck for planing rod brasses is shown in Fig. 184. It is so constructed that the brass is planed

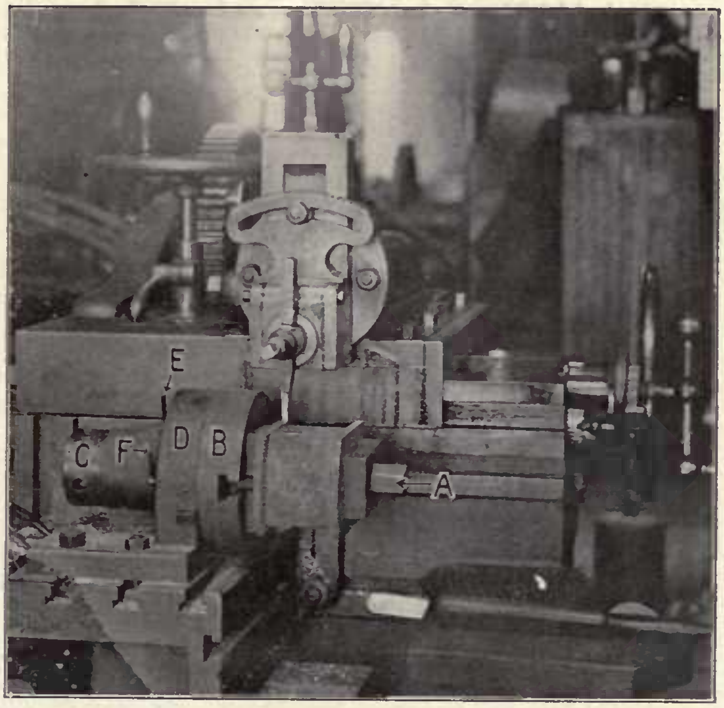


**Fig. 184—Chuck for Planing Rod Brasses.**

perfectly square on all four sides without being unclamped. Means are also provided to take care of wedge brasses. The nut *A* clamps the brass to the chuck *B*; the nut *C* holds the chuck to the frame *D*. To turn the brass 90 deg. the finger *E* is drawn down, disengaging a slot on the inside. The nut *C* is then loosened and the brass is turned until the finger *E* engages in the next slot on the inside face of *B*. This slot is cut at right angles to the first stop. The brass is turned in this way four times and is planed on the four sides. The finger *F* is used when it is desired to plane brasses at angles other than 90 deg.—*Chicago & North Western, Chicago.*

ROD BRASS CHUCK.

A device for machining strap rod brasses is shown in Fig. 185. A small angle plate is secured to the shaper table. An index plate provides for changing the position of the brass. The plate has four slots set 90 deg. apart. After the brass is secured in position it is not necessary to readjust it, but simply to remove the catch and revolve the brass a quarter turn until the catch can again be shifted into place. There is also a slot at one side

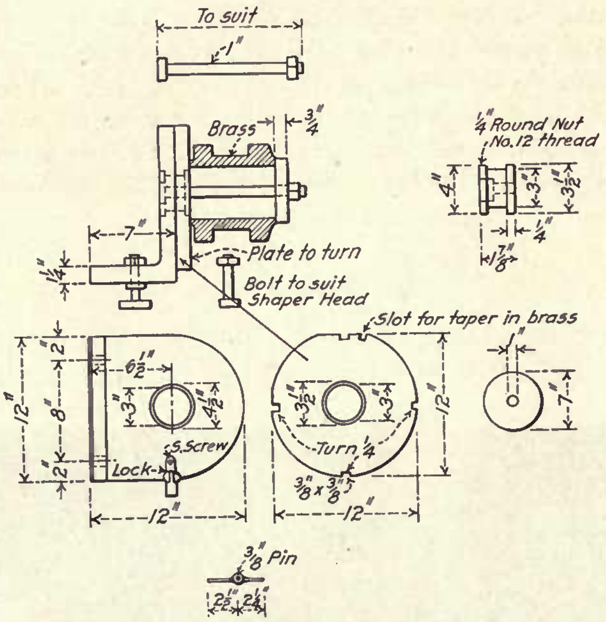



Fig. 185—Device for Planing Rod Brasses.

for planing the taper ends. This device will greatly increase the capacity of the shaper on this class of work. —*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

ROD BRASS, RADIAL CHUCK FOR.

The chuck shown in Fig. 186 was designed to plane the front half of main rod brasses. These are circular in shape, forming practically one-half of a bushing, although some of them have flat sides. The ends of the chuck for this latter type are designed accordingly, as shown by sketch *Y*. There are many chucks of this general construction, but most of them are heavy and it is necessary to remove the shaper chuck from the table when using them. This chuck is held in the shaper chuck

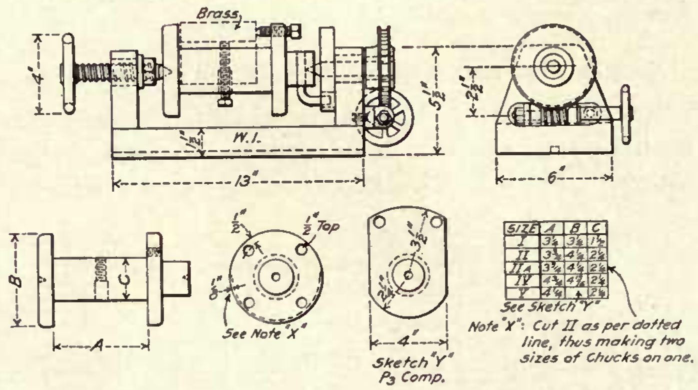



Fig. 186—Shaper Radial Chuck.

while in use, saving considerable time in changing from one class of work to the other. The ordinary shaper chuck is used for machining the rear brass of the front end of the main rod; the front half can then be machined in the radial chuck without removing the shaper chuck. This chuck can also be used for other work, such as dies, etc., on either straight or taper work. For taper work a wedge is placed under one end of the shaper chuck.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

ROD BUSHING REAMER.

A reamer for truing solid rod bushings after they have been applied to the rod is shown in Fig. 187. It is a handy, adjustable cutter for use on a drill press; the various parts are of mild steel, except the 5/16-in. cutters, which are of high-speed steel. Rod bushings are bored to pin size, applied to the rod and then placed on the drill press for truing with this tool. The plunger *M* is recessed to lighten it and is also slotted to carry the cross bar *N*, which, actuated by the knurled nut *D*, forces *M*

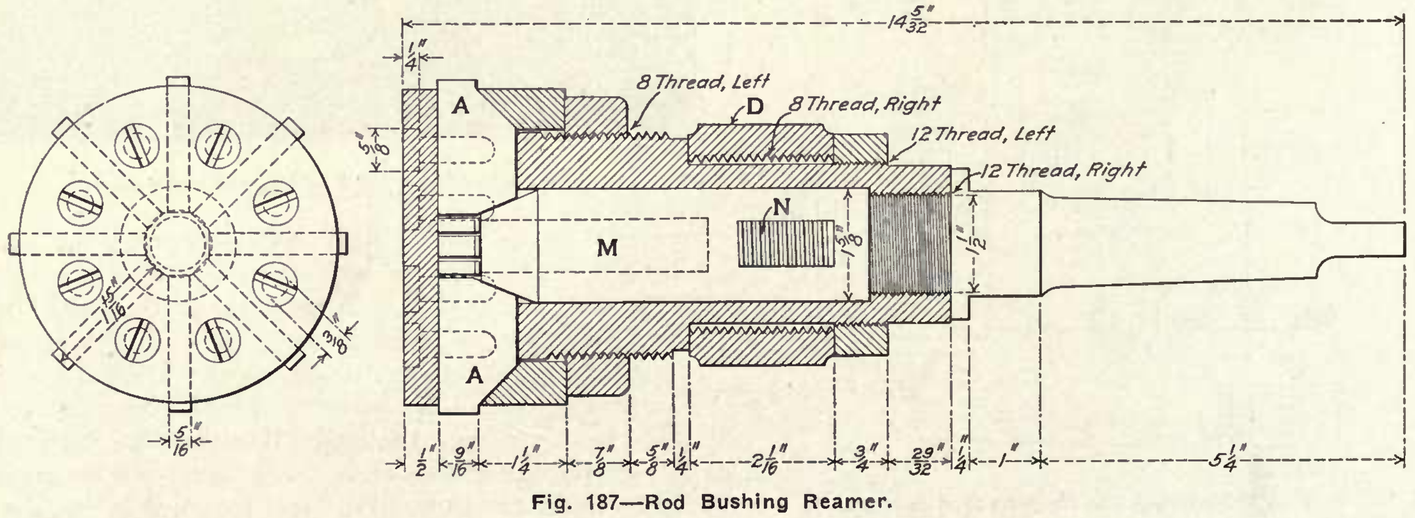



Fig. 187—Rod Bushing Reamer.

backward or forward, depending on whether the cutters are to be expanded or contracted. With it and a drill press equipped with an air clamp, a rod may be reamed and handled, floor to floor, in five minutes.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

### RODS, MILLING.

Side rods are roughed off and finished in one operation at the Chicago shops. The special tools for doing this work are shown in Fig. 189. One of the cutters

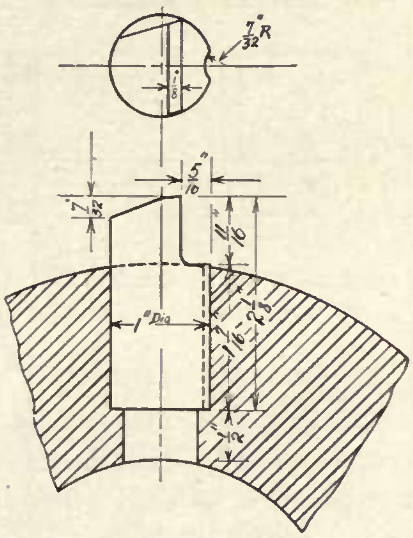


**Fig. 188—One of the Cutters in Milling Tool for Side Rods.**

(there are 216 in the tool) is shown in Fig. 188. These cutters are driven in straight and are kept from turning by prick-punching the arbor, forcing the soft metal of the arbor into the 7/32-in. recess of the cutter. The results from these tools have been excellent. They seldom require grinding and are run at a cutting speed of 6 to 8 in. per minute, taking a ½-in. cut.—*Chicago & North Western, Chicago.*

### RODS, SLOTTING END.

There are a number of methods of forking side rods. They are frequently drilled at the bottom of the slot and the piece is parted out by running in two cuts, as shown by the dotted lines in *B*, Fig. 190. Sometimes this is done on a rotary saw, and sometimes on a shaper or

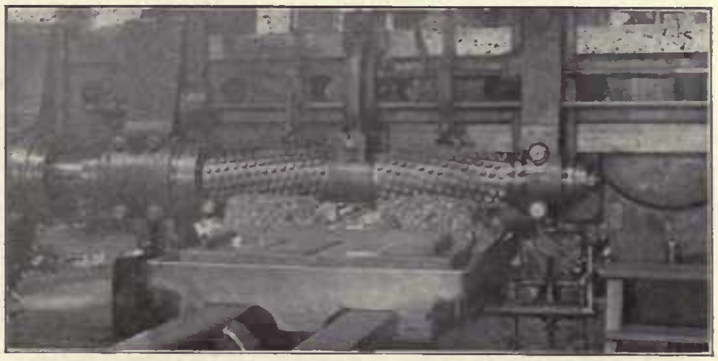


**Fig. 189—Milling Side Rods.**

planer. These methods appear crude and costly, and in order to improve them the tool post, shown in the illustration, was designed. The tool is put in a slotter and the metal is cut out as in ordinary slotter work. By using a heavy duty machine no trouble is experienced with even such a wide roughing tool as that shown. The use of these tools has reduced the total time of cutting out the fork one-half.—*Frank Rattek, Brighton, Mass.*

### SHOES AND WEDGES, BRASS.

Brass shoes and wedges are used in the Dale street shops of the Great Northern at St. Paul, Minn. They are milled out, 10 being milled at one operation. Instead of planing, the sides are ground on a grinder.

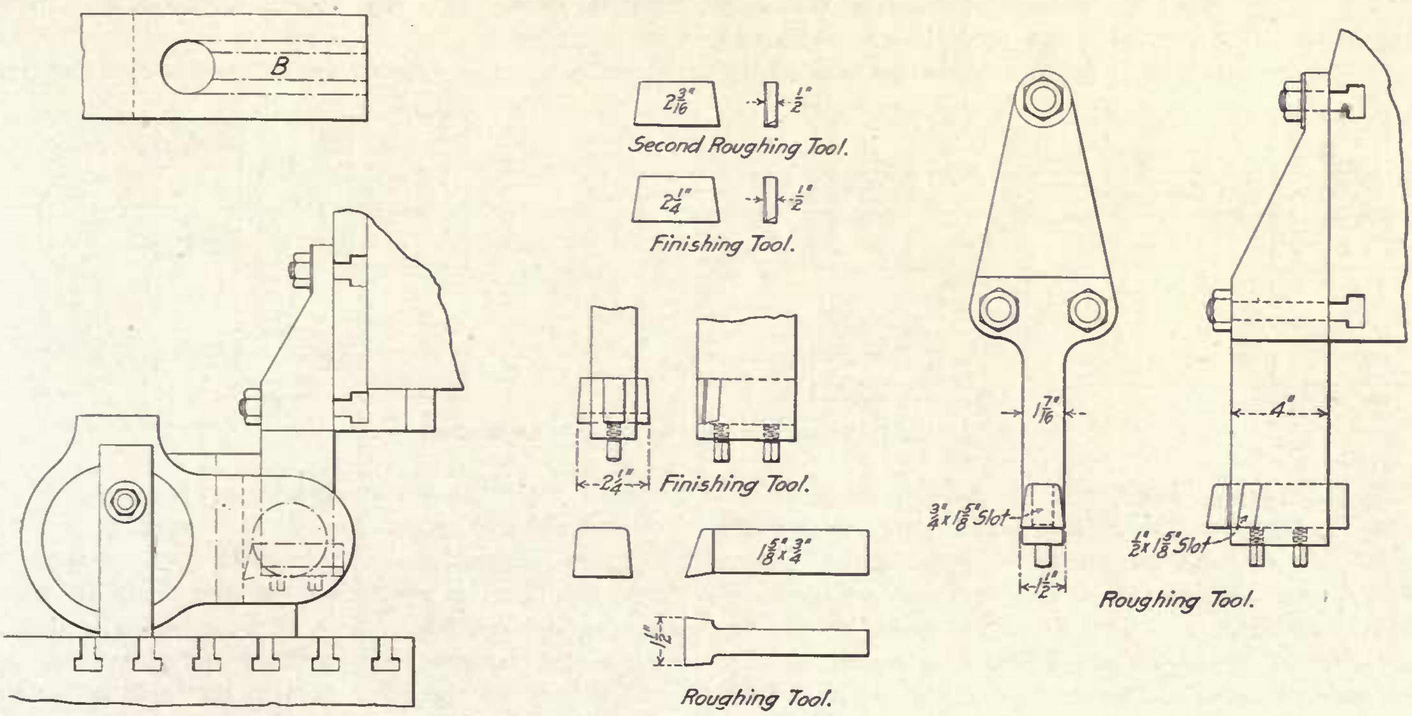



**Fig. 190—Tool for Forking Side Rods on a Slotter.**

### SHOES AND WEDGES, MILLING.

A quick and cheap method of machining the inside and outside of shoes or wedges at the same time is illustrated in Fig. 191, the machine being shown set up for wedges. They are bolted to the cast steel jigs by ¾-in. countersunk head bolts, the nut being placed on the under side of the jig. One bolt is sufficient for each wedge as the ends are securely blocked. The holes can generally be drilled in a place where they may later be used for hold-

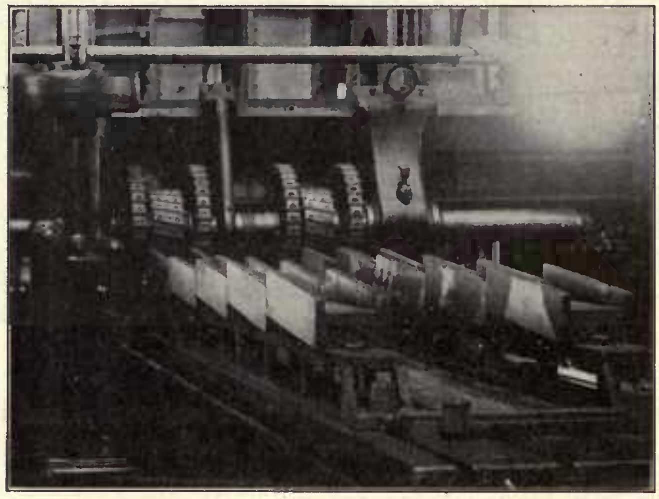


**Fig. 191—Milling Shoes and Wedges.**

ing the wedge to the frame jaws. The wedges are blocked up on one end to give the required taper.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

### SHOES AND WEDGES, MILLING.

We finish all shoes and wedges on a milling machine, machining both the inside and outside at one operation. One man will finish 40 of these in 10 hours. The chuck for holding the shoes and wedges is shown in Fig. 192. The blocks *A, B, C* and *D* are made of cast steel and have tongues which fit in the grooves in the table of the

### SHOES AND WEDGES, MILLING.

A gang tool for milling crosshead gibs, shoes and wedges is shown in Fig. 195. This tool is used on a horizontal milling machine, the chuck blocks shown in Fig. 193 being used for holding the work. In milling shoes and wedges with this tool, the outside of the shoe or wedge is machined with the large tools having 16 in-

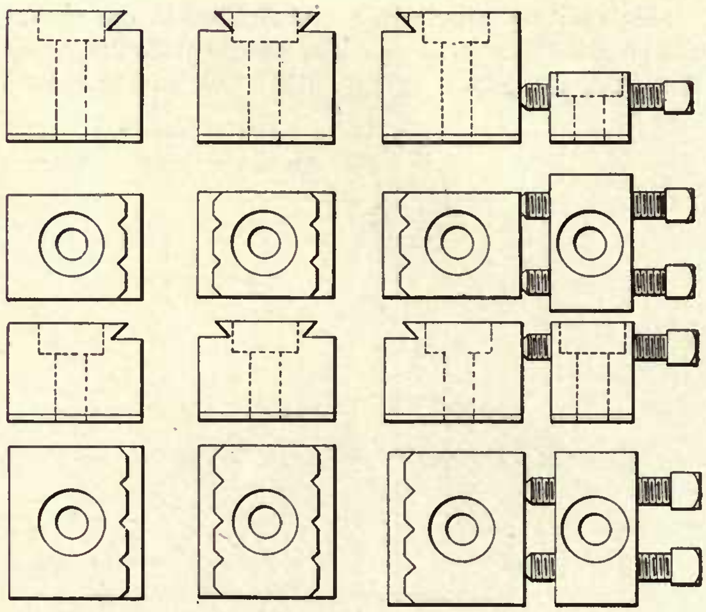


**Fig. 193—Chuck Blocks for Shoes and Wedges and Crosshead Gibs.**

serted cutters of high-speed steel, ¾ in. in section, the cutting points of which make a 16-in. diameter circle. The frame fit of the shoe or wedge is made with a tool 10½ in. in diameter, with 16 inserted blade cutters. An adjustable telescopic sleeve is used for gaging the thickness of the flanges. In finishing the edges of the flanges, mills of proper diameter are used by inserting them in the gang head. This edge milling on the flanges, however, is applicable only to shoes.

The body of the outside tools is made of two soft steel

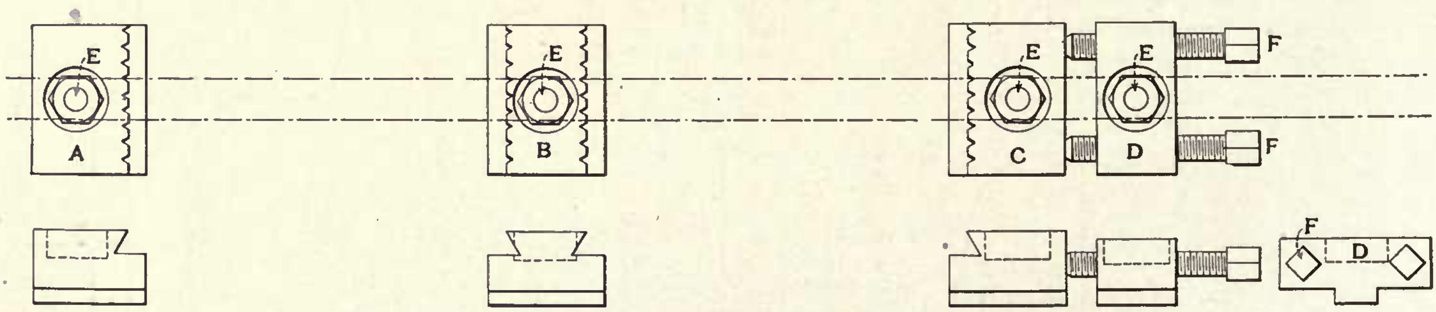



**Fig. 192—Chuck for Milling Shoes and Wedges.**

milling machine. The blocks are held in place by the bolts *E*. The shoes are placed between the upper parts of the blocks and these are then forced tightly against the ends of the shoes by screwing up the set-screws *F* in the tail block *D*. The shoes are milled at the top and sides in one operation.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

forgings; the main, or outside member, has a hub which is bored and key seated for the main spindle, and the inner face is turned at an angle of 45 deg., the angle of the tool. The two pieces are clamped together, using six or eight ⅝-in. bolts. Two of these tools are used at a time, the cutters being ground right-hand on one and left-hand on the other, so that they will cut in the same direction. The mill used for cutting out the frame fit has inserted cutters at proper angles to form a spiral. This member is made solid of soft steel, forged from an old locomotive axle and is bored and key-seated to suit the main spindle. The inserted cutters in this head or mill are 1½ in. wide x ⅜ in. thick, and of lengths to suit

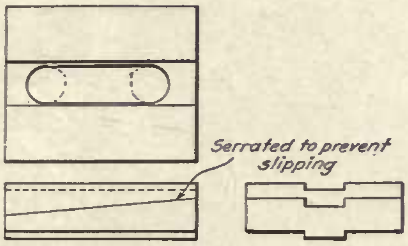



**Fig. 194—Adjusting Wedge for Elevating Center Chuck Block in Milling Wedges.**

the frame fit required. An adjusting wedge for elevating the center chuck block in milling wedges is shown in Fig. 194. With this gang miller it is possible to mill a shoe and finish both inside and outside, in 15 minutes. —*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

SHOES AND WEDGES, PLANING.

A method of holding locomotive shoes and wedges for the final operation of planing the face and edges after the castings have been returned, popmarked, from the erecting shop is shown in Fig. 196. Much difficulty has been experienced in these shops in the matter of setting and holding shoes and wedges to the popmarks, as the faces of the frame legs do not always wear at right angles, often being as much as 1/64 in. and 1/32 in. out of true. This necessitates the use of wedges and shims in chucking, which on account of the repeated blows of the planer tool are very difficult to keep in place. This method also requires considerable time in setting the job. The chuck here shown was designed by W. P. Spade, shop specialist at the Mt. Clare shops, to overcome these difficulties and it meets the requirements admirably. The chuck is made of cast iron, and, as is seen in the illustration, tongues are cast on it, which fit the T-slots of the planer bed. The chuck is made in two pieces so that it can be opened or closed to accommodate castings from 12 to 24 in. in length, or, in fact, of any required length. This arrangement permits of chucking the work at its ends to obtain

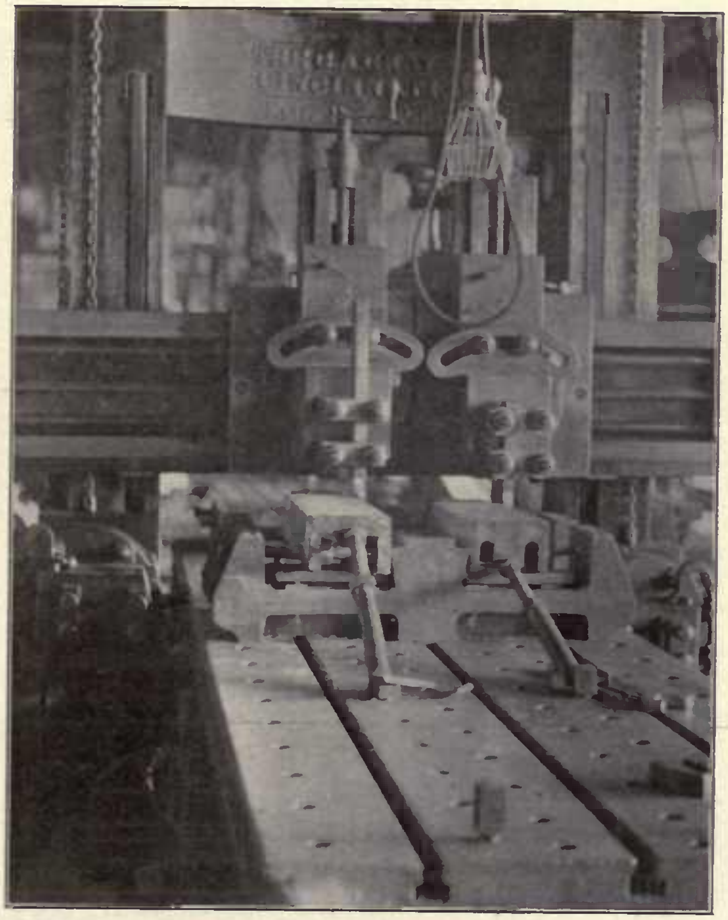


**Fig. 196—Shoe and Wedge Chucks.**

the greatest holding power. Instead of using the regular round-pointed pins for holding the work, pins shaped similar to a flat chisel are used. This provides more holding surface than the round pins, and the flat surfaces do not leave unsightly marks, which is especially the case

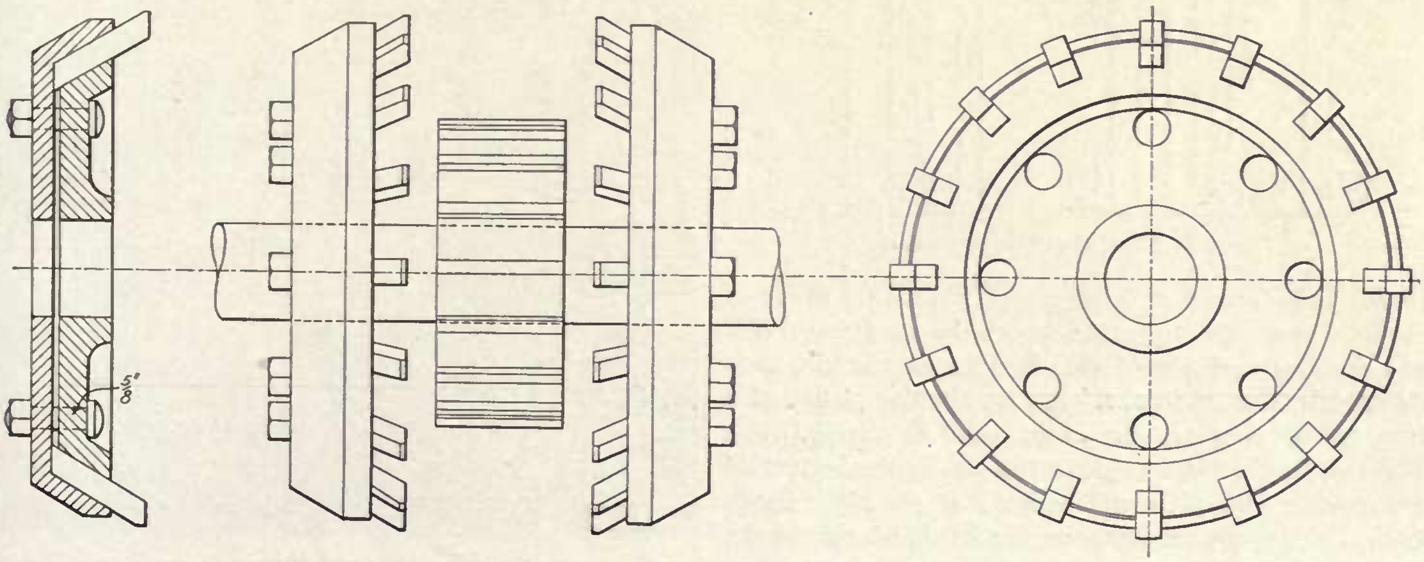



**Fig. 195—Gang Milling Cutter for Shoes and Wedges and Crosshead Gibs.**

when using pointed pieces on brass shoes and wedges. The flat pins effectively prevent slippage, which is more pronounced when working soft metal such as brass. Round points forge into the metal from the continual shocks of the tool, especially when it is cutting at a rate of about 40 ft. per minute. The pins are forced against the work by ordinary set-screws and the opposite sides of the shoes bear against the sharpened edges of steel plates, which are held in place by the pressure and grooves cut in the center section of the chuck. These plates, which point slightly downward, are 4 in. long and 1 in. wide. Their position is shown in the illustration.

The vertical adjustment of the casting is obtained through four set-screws, by which the strips upon which the casting rests, are raised or lowered. Spreader bolts are placed between the flanges to prevent them from springing. The jacks seen in the foreground are used merely to absorb the shocks of the tool and have no particular effect in holding the castings in place. These are made of 1-in. bolts and pieces of 1-in. pipe. An increase of 80 per cent. in output and much better work has resulted from the use of these chucks.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### SHOES AND WEDGES, PLANING.

A partial view of a small planer which handles the finishing of shoes and wedges is shown in Fig. 198. The

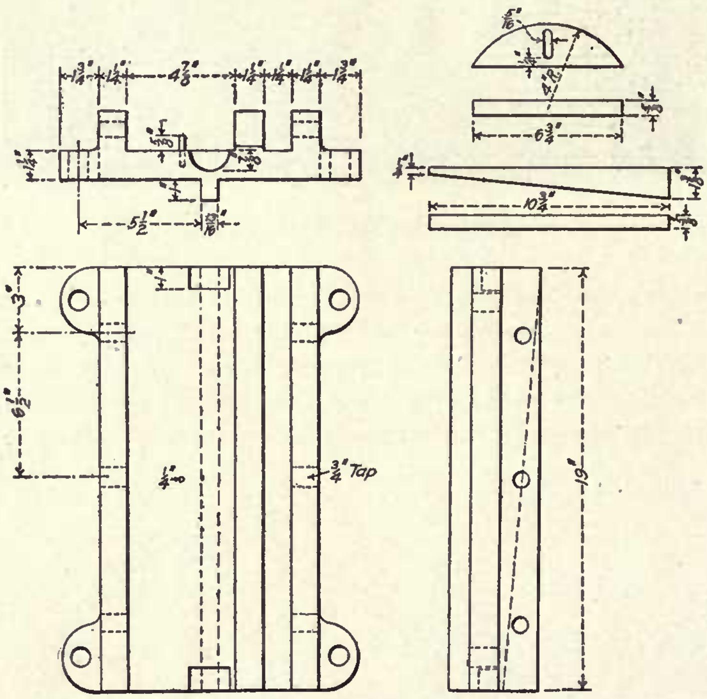



**Fig. 197—Shoe and Wedge Chuck.**

chuck is also shown in detail in Fig. 197. One flange of the shoe or wedge is placed between the set-screw points and the cast partition of the chuck, against which it is clamped by the set-screws. A part circular plate and a long tapered key are shown in detail in the drawing. The slot in the plate engages the pin in the bottom of the chuck. This plate and wedge hold the other flange against the single set-screw on the left-hand side of the chuck. The adjustments for height to get the popmarks

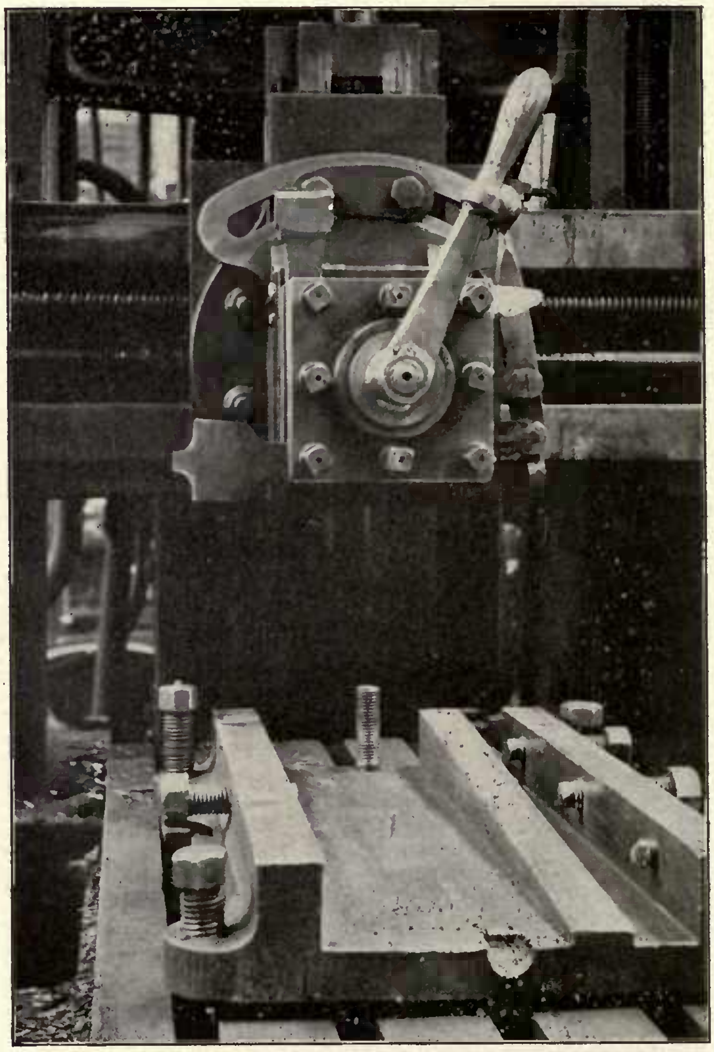


**Fig. 198—Shoe and Wedge Chuck on Small Planer.**

in position are gotten by the four vertical corner screws, which adjust the entire chuck. A turret tool holder is used on this machine. It is capable of holding four tools, one for roughing, one for finishing and two for the fillets. —*Central Railroad of New Jersey, Elizabethport, N. J.*

### SHOES AND WEDGES, PLANING.

The shoe and chuck, Fig. 199, is a forging. Lugs on the bottom fit in the grooves of the platen, and clamps

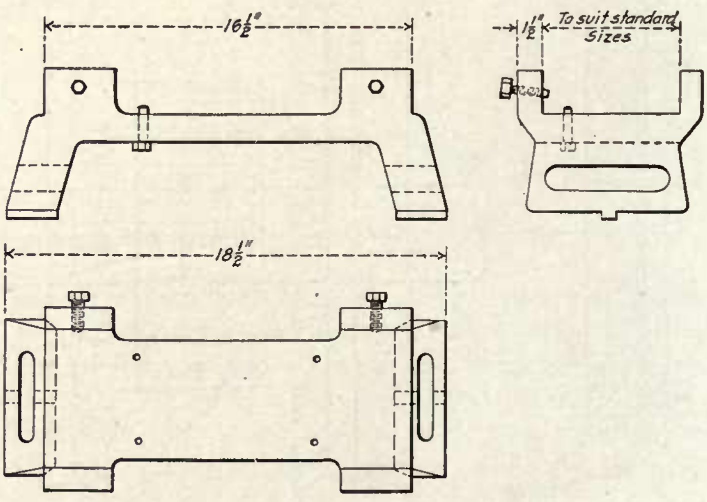



**Fig. 199—Shoe and Wedge Chuck.**

are inserted through the openings at the ends. Two sizes of chucks of this design are sufficient to accommodate all the shoe and wedge sizes used in the Erie shops at Galion, Ohio. The shoe or wedge is adjusted to position by four set-screws, making it unnecessary to use shims. The construction of the chuck is such that these set-screws are easily accessible. The castings are held by four other set-screws, which engage it at an angle as shown.—*L. M. Granger, Assistant General Foreman; and John Todd, Machine Foreman, Erie Railroad, Galion, Ohio.*

### SHOES AND WEDGES, PLANING.

The ouside faces of shoes and wedges are finished in a chuck, a section and elevation of which are shown in

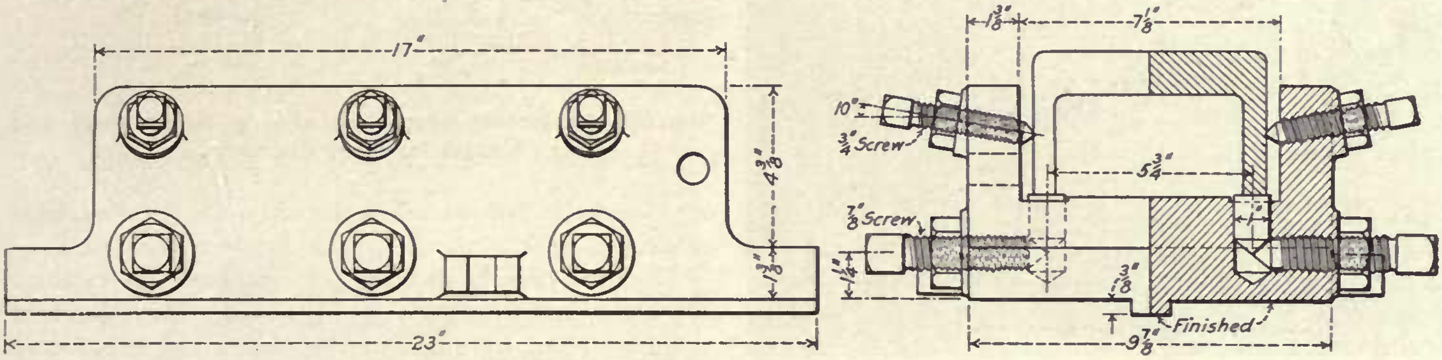


**Fig. 200—Chuck for Planing Shoes and Wedges.**

Fig. 200. The flanges rest on dowel pins that have conical ends and which can be forced up by set-screws entering from the side and having similar ends. 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 it in the usual manner.—*Delaware, Lackawanna & Western, Scranton, Pa.*

### SHOES AND WEDGES, PLANING.

The planing of shoes and wedges at the Sayre shops is of especial interest; the three photographs, Figs. 201, 203 and 204, show all the processes from the rough casting to the finished part. As far as possible the number of patterns is reduced to a minimum. This, of course, requires the removal of a large amount of stock in some cases and it is questionable whether it is more economical to save handling a large number of patterns in the foundry, or save the additional time required in the machine shop to remove the surplus stock. Shoe and wedge castings illustrate this minimum-pattern idea strikingly.

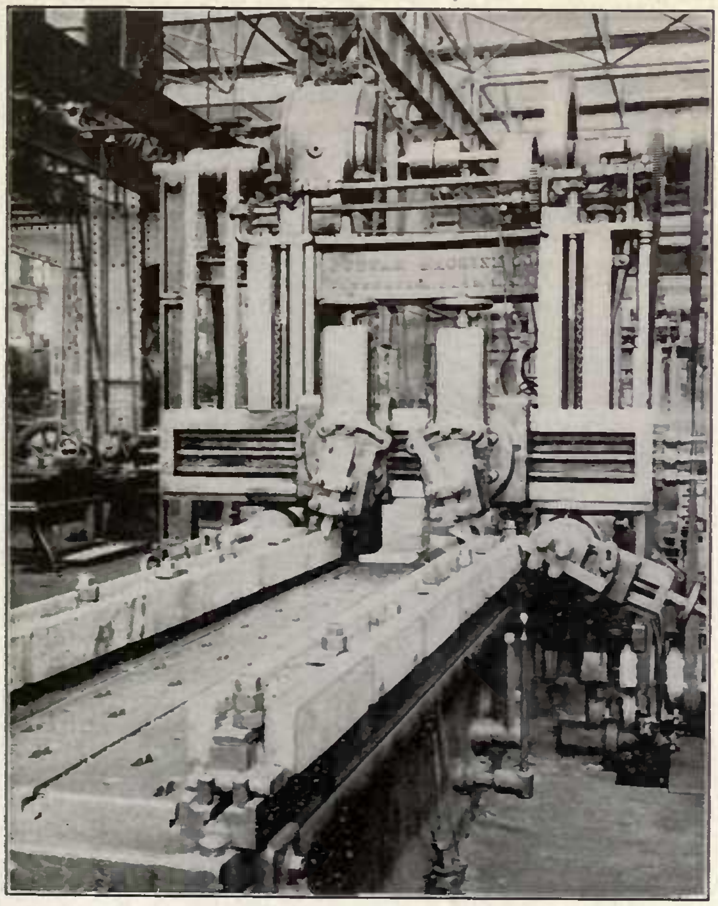


**Fig. 201—First Operation in Planing Shoes and Wedges.**

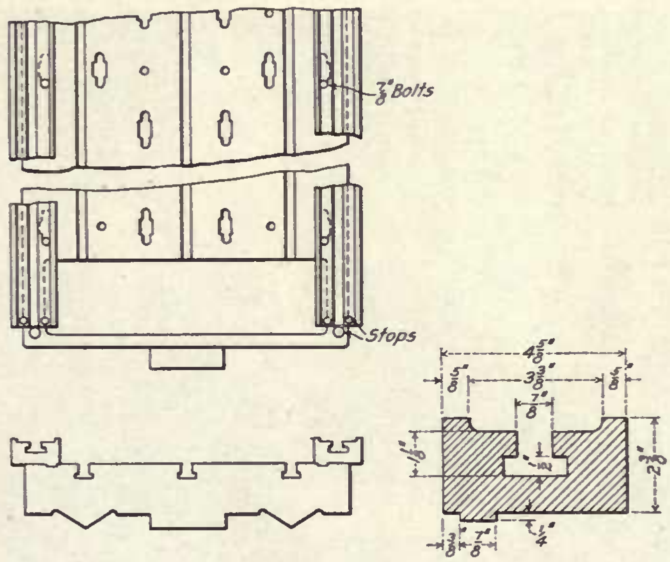


**Fig. 202—Application of Extension Parallel Strips to Planer Table.**

A Putnam planer, as used in the first operation of this work, is shown in Fig. 201. In order to use the four heads of the machine at the same time it was necessary to apply two permanent extension parallels to the platen. The application of these is plainly shown on the photographs and also on the drawing, Fig. 202. This provision allows the use of the two cross-rail heads

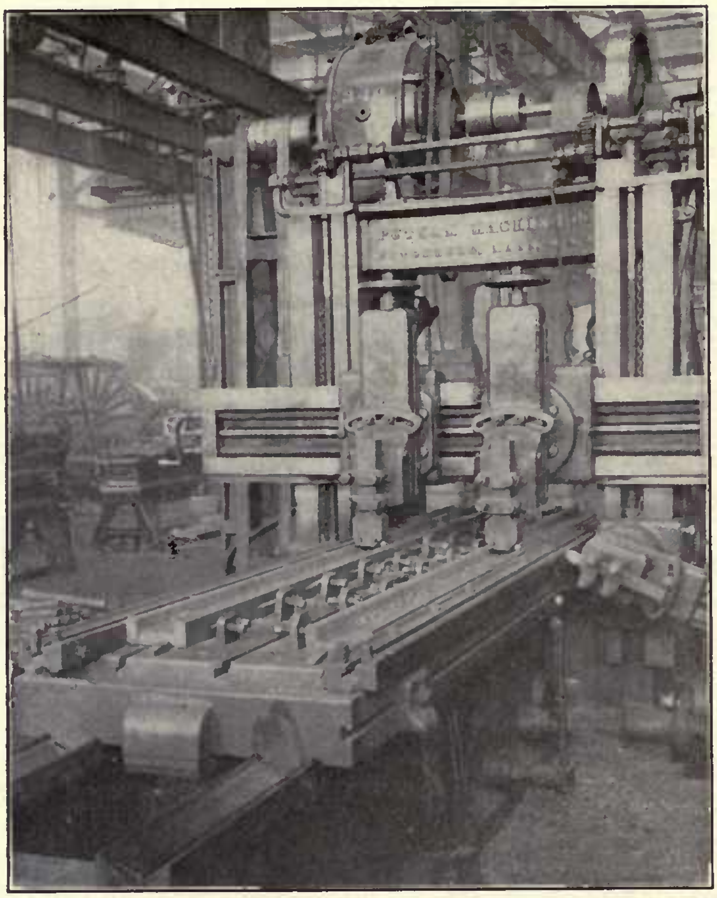


**Fig. 203—Planing the Inner Sides of Flanges and Face of Shoes and Wedges.**

for machining the tops of the flanges and the vertical work on those sides toward the center of the platen, while the side heads do the outside vertical sides. The

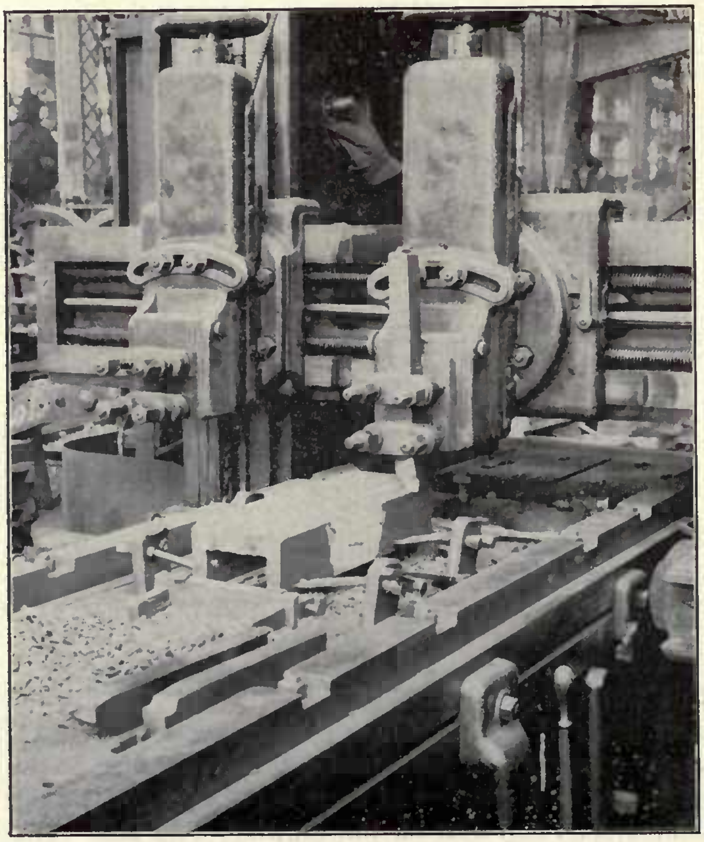


**Fig. 204—Final Operation in Finishing Shoes and Wedges.**

castings are held free of the machine bed and are finished on the top of the flanges and the sides at one setting. The parallel strips are made of iron or soft steel and extend the full length of the bed. A special slot is cut in the bed to receive the lug on the parallel. Two permanent stops are provided against which the castings

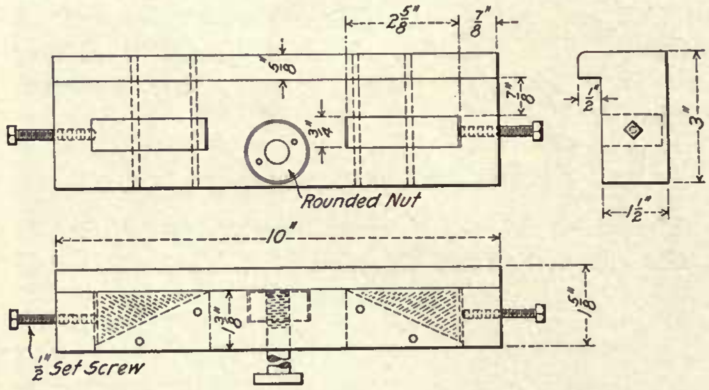



**Fig. 205—Device for Supporting and Adjusting Shoes and Wedges for Final Operation.**

are clamped. The shoes are placed on the parallel strips as shown, with a clamping bolt between each pair.

After the outside surfaces are machined, the castings are rechucked as shown in Fig. 203. They are held against sliding by stops in the platen and are forced against the parallel strips by the set screws and chisel points. Two-cutter tools are used for machining the flanges and an ordinary tool on the horizontal surfaces.

After being layed-off, the final operation is handled on the machine shown in Fig. 204. Two small parallel strips are used for supporting and adjusting the casting. The drawing, Fig. 205, shows a detail view of one of these parallels. The wedges are adjusted by set screws, the work being very quickly performed. The casting is clamped firmly in position by the set screws and chisel points, and heavy cuts may be taken.—*Lehigh Valley, Sayre, Pa.*

### SHOES AND WEDGES, PLANING.

A chuck for planing the faces of shoes and wedges after they have been laid off on the engine is shown in Fig. 206. It consists of a bed plate *C* with three T-slots, the central one being used by the two T-bolts which hold the guide bar *A* in position. This guide bar is the same

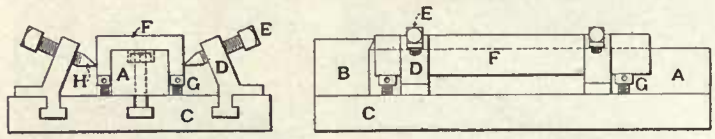



**Fig. 206—Chuck for Planing Shoes and Wedges.**

size as the frame jaw, so that the shoe and wedge fit over it snugly. There are two dogs *D* on each side of *A* and near its ends; the steel screws *E* which pass through the dogs are balled out at the ends to take the center points *H*, which hold the shoe firmly in position. The block *B* is made of tool steel, the top of it coming in contact with the shoe, as shown. The shoe is set on the guide *A* and may be adjusted by turning the round-head screws *G*; the heads of these screws have six 5/16-in. holes and are turned by means of a pin 7 in. long, made of hard steel wire, tapered at one end to enter the holes easily. By means of this device it is possible to adjust a shoe or wedge in from one and a half to two minutes and to hold them securely under any feed or depth of cut.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

### SHOES AND WEDGES, PLANING.

A chuck for planing shoes and wedges to the pop-marks is shown in Fig. 207. It has a longitudinal strip cast on the bottom which fits the slot of the planer bed; it is clamped down by two bolts which tap into a strip in the slot. The counterbored holes allow the bolt heads to be below the surface of the chuck, and as the bottom of the counterbore is ball-shaped, a tilting movement of the chuck is permitted. The shoe or wedge is placed in the chuck and the four 1-in. set screws set up lightly against it. The usual thin wedges are used

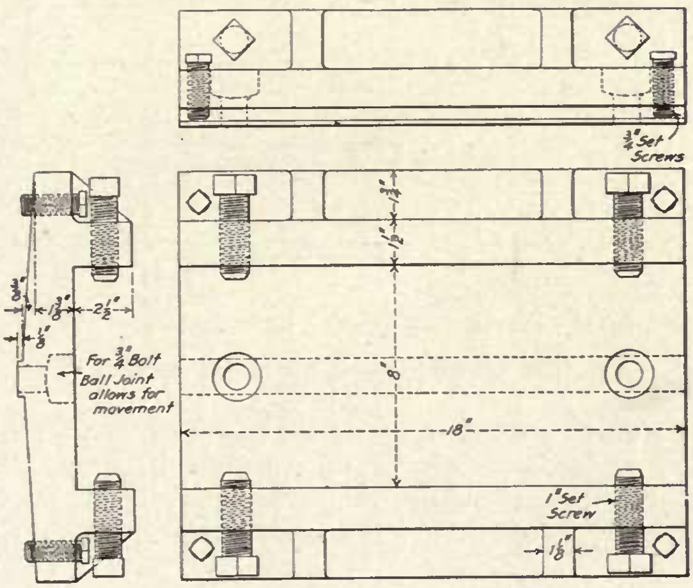



Fig. 207—Shoe and Wedge Chuck.

under the flanges of the casting to bring the two pop-marks on the outside flange up to the surface gage. When these points are correctly located, the four set screws are set up firmly and then the chuck itself is adjusted to bring the third pop mark to the same height as the other two. This adjustment of the chuck is accomplished by the four ¾-in. set screws, one at each corner of the chuck, which bear against the bed of the planer. —*Long Island Railroad, Morris Park, N. Y.*

### SLOTTER OR LATHE BRAKE.

The slotter or lathe brake, shown in Fig. 208, enables the operator to stop a machine at any point, thereby saving the time and labor necessary to pull the belt. A substantial brake of this kind is important on a slotting machine. The brake, which is applied to the large step of the cone, consists of an expansion ring of 3-in. x 3/16-in. steel, formed to a circle ½ in. less in diameter than the inside of the cone. On the outside of this ring a band of wood fiber is riveted, which latter makes the friction contact. A compression spring and a dog are arranged to apply and release the brake. The block, which is riveted to one end of the band, is slotted to admit a cam or eccentric-shaped dog, keyed or pinned to the shaft. Through a series of bell cranks and rod connec-

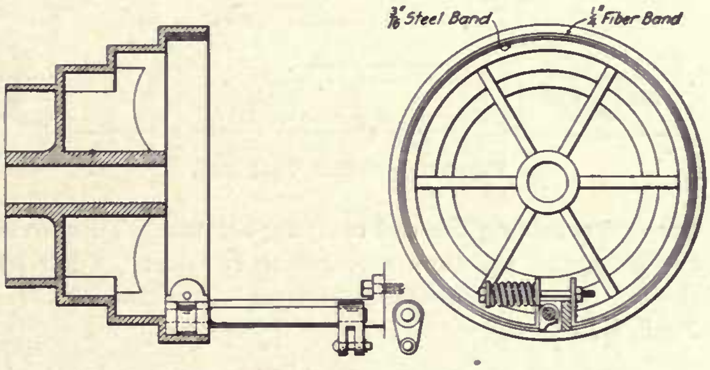



Fig. 208—Brake for Slotter or Lathe.

tions the hand lever for operating this brake can be placed in any convenient position. The same idea is applicable to wheel lathes by reversing the action or contracting the band instead of expanding it, as the brake must be applied externally to the largest step of the cone.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

### SLOTTER TOOL BAR.

The slotter tool bar, shown in Fig. 209, was designed to save resetting of the tool on the plate when a change was made in the direction of the cut. It is also advantageous in that it allows the use of small pieces of high speed tool steel. The slot will take ½-in. steel, which is held in place by tightening the top nut. When it is necessary to change a slotter tool at the plate, in order to change the direction of the cut, the exact stroke is often lost. With this tool, the stroke is not altered at all and the cutter may easily and quickly be

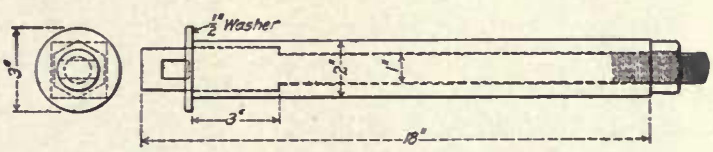



Fig. 209—Slotter Tool Bar.

adjusted to any position by loosening the nut at the top of the tool.—*Central Railroad of New Jersey, Elizabethport, N. J.*

### SLOTTER TOOL BAR.

A slotter bar, fitted with a clapper box which acts to relieve the tool during the return stroke, is shown in Fig. 210. The tool is held in the clapper by the two set screws which tap in from the bottom. Slots in the bottom of the bar provide for the movement of these screws.

The coil spring, shown dotted, acts to return the tool to the cutting position after it is free of the work and before the cutting stroke begins. Adjustment of the tool is also provided by loosening the nut at the top of the

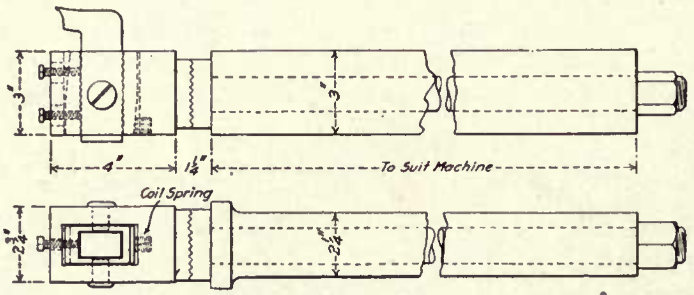



Fig. 210—Slotter Tool Bar.

bar and revolving the end carrying the tool. This saves the work and the time required to readjust the bar on the machine head.—*Long Island Railroad, Morris Park, N. Y.*

SLOTTER TOOL BAR.

The slotter tool bar, shown in Fig. 211, is made of soft steel and is 29 in. long. The lower end, which holds the tool, is made 2¾ in. square and is slotted to receive the movable block in which the tool steel cutter is held. This block moves on the ⅜-in. pin. When making the downward, or cutting, movement the steel

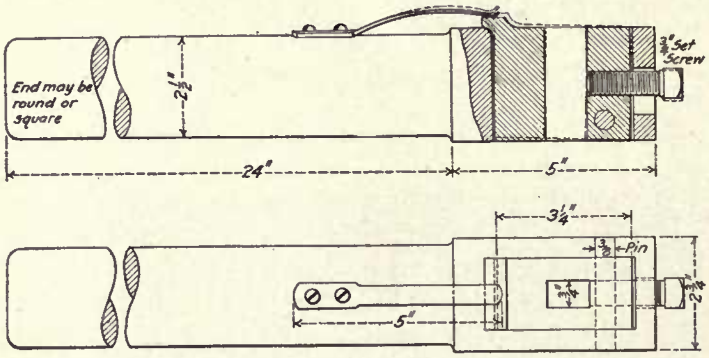



Fig. 211—Slotter Tool Bar.

spring holds the block in position, but on the upward, or return, stroke the block takes the position indicated by the dotted lines. This relieves the cutting edge of the tool, which ordinarily drags against the work on the upward stroke.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

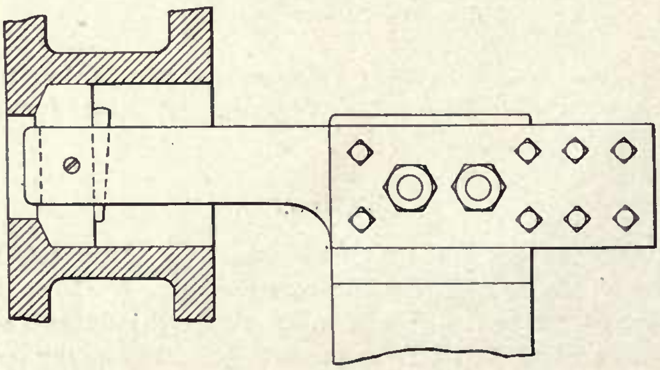


Fig. 212—Boring Stuffing Box.

STUFFING BOXES, BORING.

In order to reduce the expense of boring out stuffing boxes and glands the tool shown in Fig. 212 has been designed. It consists of a boring bar with a slot in the end and a self-centering tool held therein by means of a key. A tool of this type is first used as a roughing tool, and then the inside of the box is finished with a cutter of the standard size, which reams it out at the sides and gives the proper shape at the bottom to fit the packing.—*Frank Rattek, Brighton, Mass.*

SURFACE GAGE FOR HORIZONTAL BORING MILL.

The gage, Fig. 213, consists of a V-shaped block similar to the base of an ordinary surface gage. A needle or pointer is secured to the base and is adjusted by

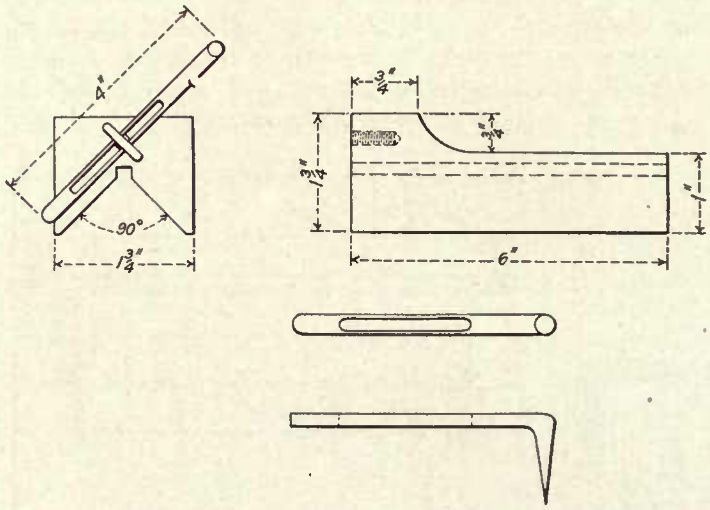



Fig. 213—Horizontal Boring Mill Gage.

the thumb screw and slot as shown. This tool is used for truing work similar to a surface gage.—*L. M. Granger, Assistant General Foreman, and John Todd, Machine Foreman, Erie Railroad, Galion, Ohio.*

SWITCH STAND STEMS, CHUCKS FOR.

The chuck shown in Fig. 214 is made to fasten on the side of a drill press table, or, where the table is not suitable for this purpose, it may be bolted to an angle iron fastened to the table, and high enough to allow the hook on the switch stem to clear the table. The round block, which fits in the body of the chuck, has a small flange on the outer edge, which keeps the block from dropping out when it is turned. The hole for the milling cutter is located near the outer edge of the block so that any throw of switch stem used on a Ramapo or on a quarter arch switch may be obtained. A set screw on the side of the chuck holds the eccentric block in place. When it is set for a certain throw, and a number of stems of the same throw are to be handled, a mark should be made at the edge of the hole in the body of the chuck and on the outer edge of the block. The milling cutter used with this chuck is cupped out at the top, and a small hole is drilled to the hole in the center of the cutter. This provides for the oil or cutting compound reaching the cutting edge.—*C. J.*

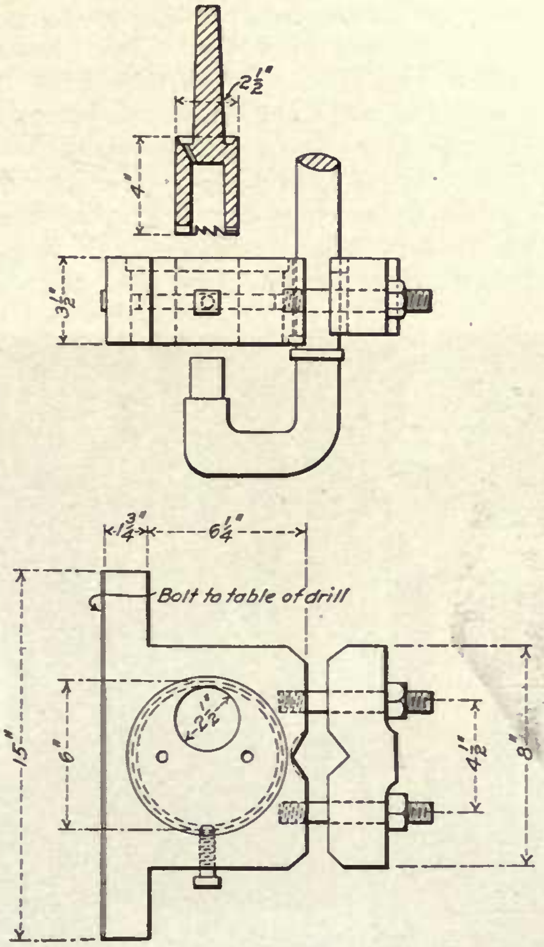



Fig. 214—Chuck for Turning Switch Stand Stems.

*Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

TIRE BORING CHUCK.

A good chuck and drive for tires on a boring mill is shown in Fig. 215. The bases *A*, of which there are four, are bolted to the faceplate at proper distances from the center. The tire rests on the lip, as shown, and it is centered by the set-screws. The stirrup clamp *B* is then dropped over the projection on the base and a key is driven home in the slot. This holds the work

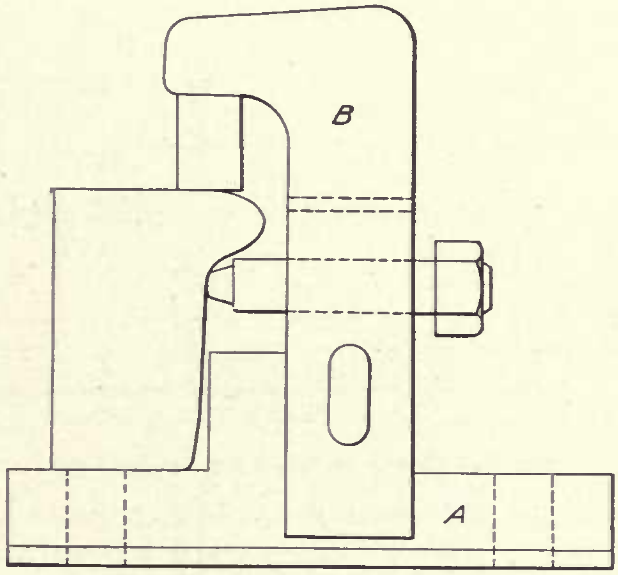



Fig. 215—Tire Chuck for Boring Mill.

down so firmly that 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, and is thus available for both turning and boring.—*Delaware, Lackawanna & Western, Scranton, Pa.*

TIRE BORING CHUCK.

Tire boring chucks, which in a general way resemble those used for truck and passenger car tires on the Long Island are shown in the accompanying photographs, Figs. 216 and 217, and the drawing, Fig. 218. The machine used for this work is a 96-in. Niles-Bement-Pond boring mill. There are six chucks in a set, made of cast iron

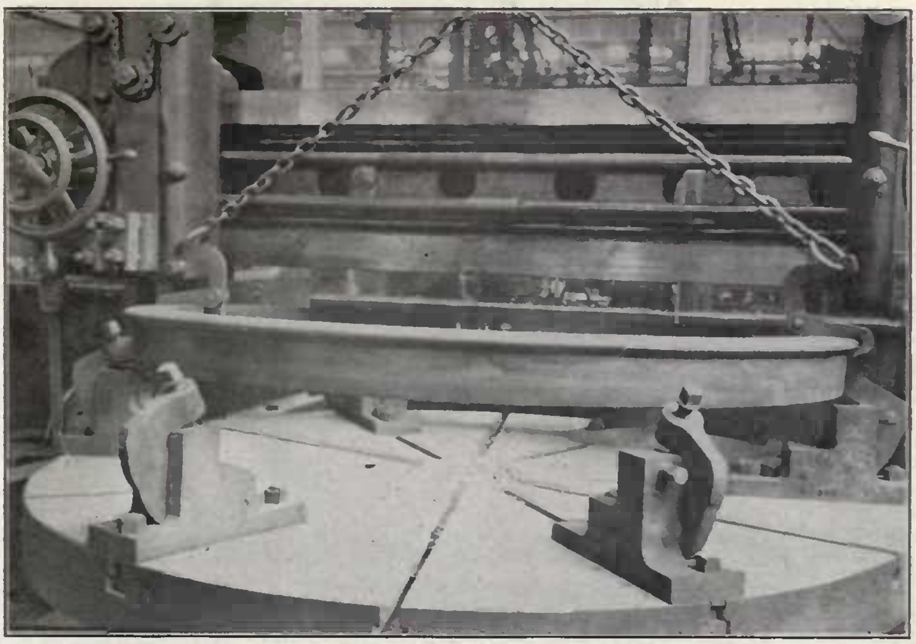


Fig. 216—Driving Wheel Tire About to be Placed in the Chucks.

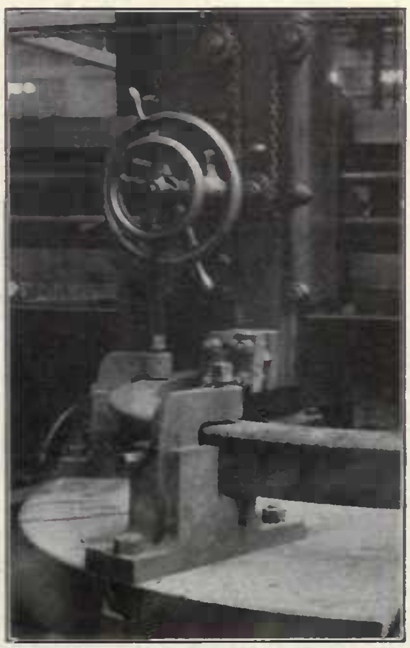


Fig. 217—Chuck Holding Tire.

and having a soft steel swinging clamp and a tool steel toothed-plate which assists in gripping the tire. The chucks are fastened to the table by three 1¼-in. T-bolts each. A lug is cast on the bottom to fit the slot in the table. It will be seen that one side of the chuck is about twice the width of the other. This was necessary to provide stock for the set screw used in adjust-

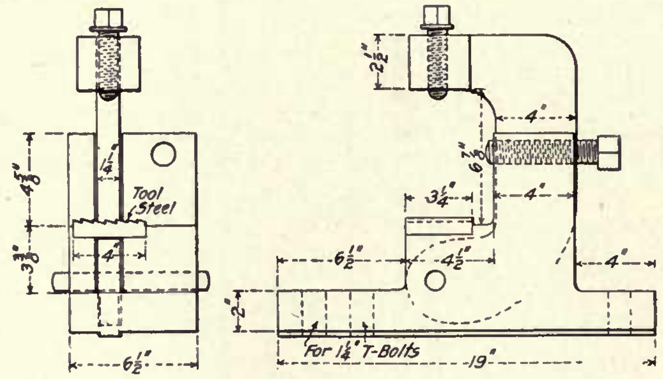



Fig. 218—Details of Chuck for Boring Tires.

ing the tire to a central position on the machine. The soft steel C-clamps are made to swing back on the pin near the base. The shop crane is used in handling tires to and from the machine; Fig. 216 shows the chucks in position for placing or removing a tire. Two tools are used, a roughing and a finishing, and a tire is bored complete in one operation.—*Lehigh Valley, Sayre, Pa.*

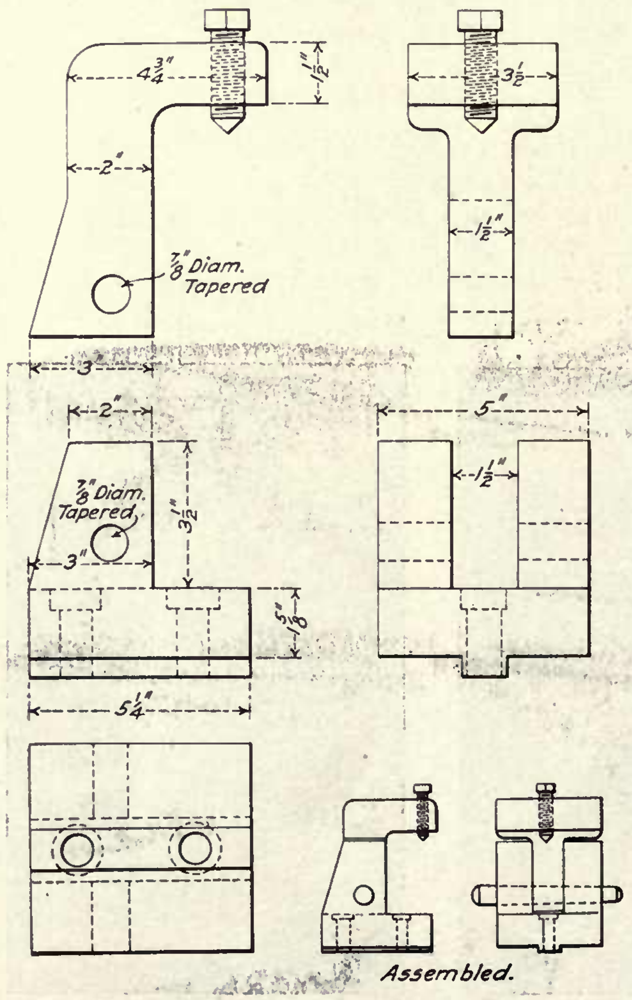



Fig. 219—Details of Tire Boring Chuck.

### TIRE BORING CHUCK.

One of a set of three chucking clamps, which are used when boring tires and cutting retaining plate surfaces at one chucking on a 42-in. Gisholt boring mill, are shown in Fig. 219. A set of these dogs in use is illustrated in Fig. 220. The chucks are fastened to the bed of the mill by two bolts each, which tap into strips fitting in the slots of the mill bed. The upper portions of the chucks fit snugly in the slots in the lower portions, and are held by large taper pins. When placing a tire on the machine the taper pins are driven out and

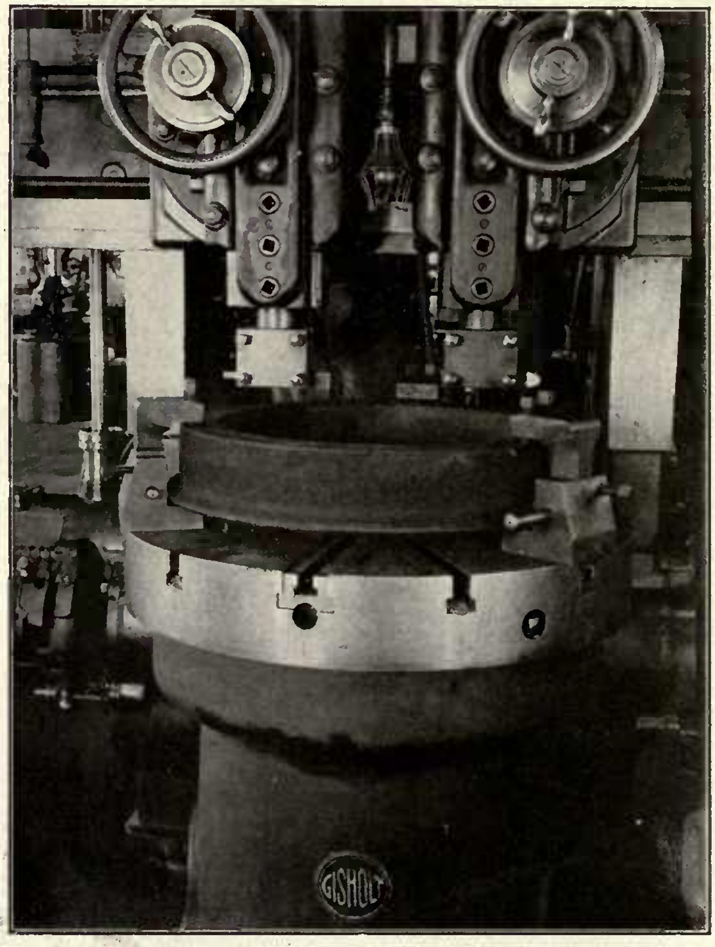



Fig. 220—Tire Boring Chucks as Used on Boring Mill.

the upper pieces removed. The tire rests on the horizontal portion of the base piece, and is adjusted to position by the horizontal set screws, which, in connection with the vertical ones in the top pieces of the chucks, hold it in place. The horizontal set screws are shown in the photo but not on the drawing. These chucks are made of axle steel and have been found very efficient, making rapid placing and removing of tires possible. The tire is bored and the retaining plate surfaces cut at one setting.—*Long Island Railroad, Morris Park, N. Y.*

### TIRE FINISHING TOOL.

A tool that is used on wheel lathes for finishing the flanges of steel wheels is shown at *A* in Fig. 221. It is arranged to cut one side of the flange at a time instead of cutting both sides at once, as is frequently done with a tool shaped as at *B*. The cutting edge, *a*, dresses 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 other side of the flange is finished with the other cutting edge of the tool. It is claimed that this can 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 wears or becomes dull it can be sharpened without cutting back to build up the flange recess, as is necessary with *B*.—*Delaware, Lackawanna & Western, Scranton, Pa.*

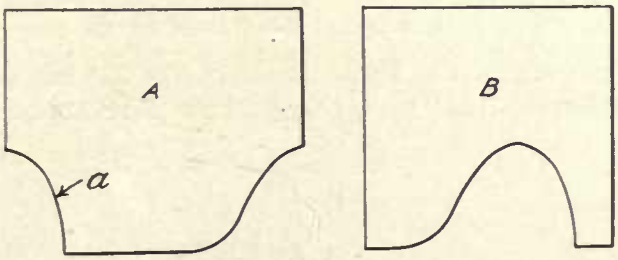



**Fig. 221—Tire Finishing Tool.**

TIRE FINISHING TOOLS, HOLDER FOR.

A holder for tools to finish the contour of tires is illustrated in Fig. 222. The object of the holder is to use steel from stock sizes requiring no machining except on the cutting edge. The dotted line shows the holder as it is made for the use of a tire flange finishing tool. When the tools become dull they are easily and quickly removed and replaced by sharp ones. As the cutter wears it may be moved forward by placing shims behind it. When it becomes too short for use, the steel may be drawn out and used for smaller tools. The clamping plate, shown dotted, holds the cutter rigidly.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

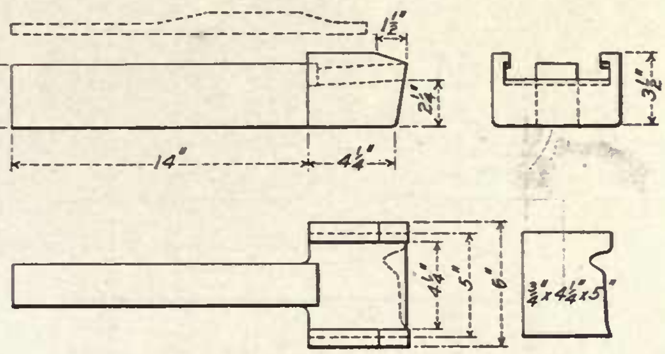


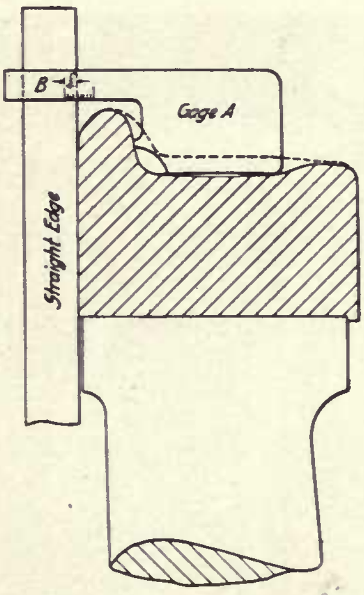

**Fig. 222—Holder for Tire Finishing Tools.**

TIRES, TURNING.

Driving wheel tires sent to the shop from outlying points are turned on a lathe, instead of a boring mill, by using mandrels made of a scrap axle and two scrap wheel centers. The latter have on their peripheries grooves for wedges, spaced 10 in. apart, the openings being 1 in. x ⅝ in., tapered 1/16 in. There are five sets of these mandrels for different diameters of tires.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

TIRES, TURNING.

With the following system of turning driving wheel tires the operator can determine before he starts turning just how much to take off the tire to make a full flange. With the old system of turning tires at random the wheel lathe operator took a good big cut. When he came to finish it he often found that he could not get a standard flange and it was necessary to take another cut. Sometimes he would get the cut too deep, thereby wasting the tire. Make a gage, *A*, Fig. 223, from No. 16 or 18 boiler steel. Put a line at *B* corresponding to the standard thickness of the flange, graduating it back about ½ in., as shown. Put a straight-edge across the inside of the tire, and read the amount the flange is worn as indicated by the gage. Opposite this amount in the table the depth of cut will be found in column *B* and the reduction in diameter in column *C*. If the flange is worn ¼ in., as shown in the illustration, the depth of cut will be 7/16 in. and the reduction in diameter ⅞ in. Caliper




| A. Flange Worn. | B. Depth of Cut. | C. Reducing Tire in Diam. |
|---|---|---|
| 1/32 in. | 1/16 in. | ⅛ in. |
| 1/16 in. | ⅛ in. | ¼ in. |
| 3/32 in. | 3/16 in. | ⅜ in. |
| ⅛ in. | ¼ in. | ½ in. |
| 5/32 in. | 5/16 in. | ⅝ in. |
| 3/16 in. | 11/32 in. | 11/16 in. |
| 7/32 in. | ⅜ in. | ¾ in. |
| ¼ in. | 7/16 in. | ⅞ in. |
| 9/32 in. | ½ in. | 1 in. |
| 5/16 in. | 17/32 in. | 1 1/16 in. |
| 11/32 in. | 9/16 in. | 1⅛ in. |
| ⅜ in. | ⅝ in. | 1¼ in. |
| 13/16 in. | 21/32 in. | 1 5/16 in. |
| 7/16 in. | 11/16 in. | 1⅜ in. |
| 15/32 in. | ¾ in. | 1½ in. |
| ½ in. | 25/32 in. | 1 9/16 in. |

**Fig. 223—Gage and Table Used for Turning Driving Wheel Tires.**

the smallest diameter of the tire with the worn flange and close up the calipers 7/8 in., and you are ready to turn off the proper amount accurately and with no guess-work. The table can be printed on good paper with a typewriter and put in a small frame and hung up at the wheel lathe so that it may be referred to conveniently. It has given splendid results in our shop.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

TOOL RACK.

To avoid having a number of cutting tools of the same kind at each machine, it was decided to issue tools for

**Fig. 224—Rack for Cutting Tools in Tool Room.**

immediate use only, which has had the effect of better maintenance of the tools and a uniformity of cutting edges for the several kinds of work. All grinding is done in the tool room and by one man, who works to a set of standard shapes. When a machine operator desires a new tool, or a freshly ground one for a dull one, he applies at the tool room window and is given a new tool, or a sharp one, in exchange for the dull one. These tools are kept in the rack shown in the photograph, Fig. 224. Each pocket is numbered, and as the tools are numbered accordingly they may be called for and delivered by number. A tool room attendant who is not familiar with the shop names of the tools, or the uses to which they are put, is thus enabled to hand them out properly.—*Lehigh Valley, Sayre, Pa.*

TOOL POST, PNEUMATICALLY OPERATED.

The pneumatic tool post shown in Fig. 225 has been used in the Grand Rapids shop of the Pere Marquette

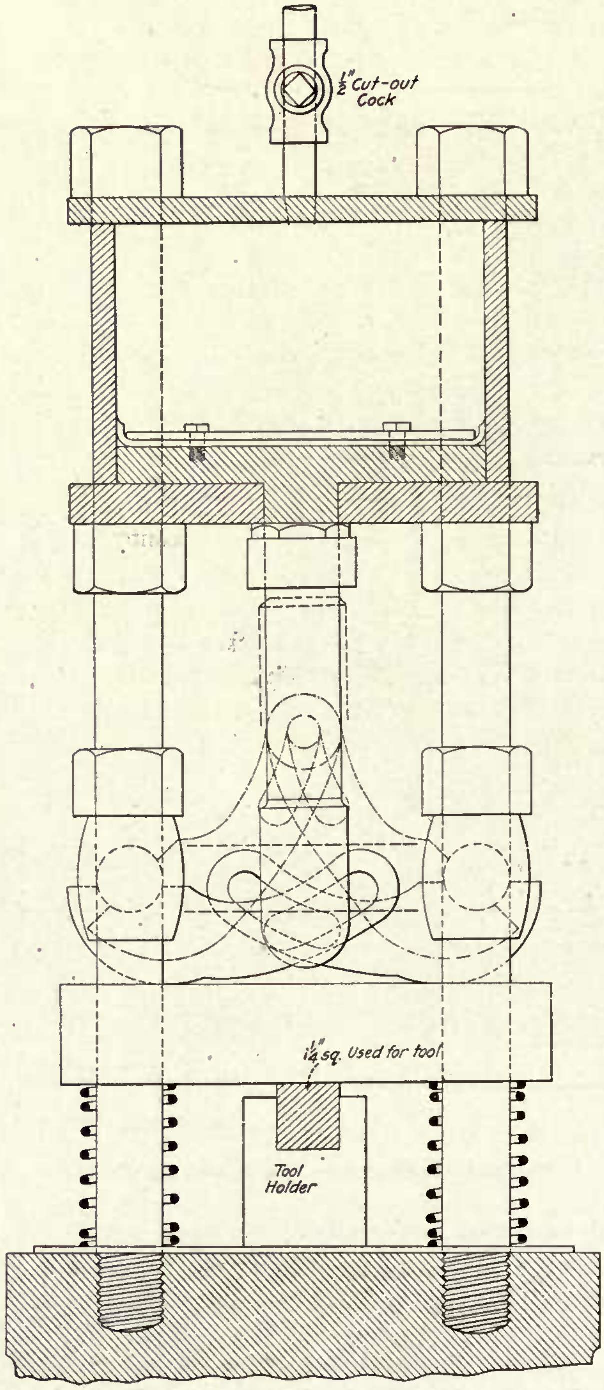



**Fig. 225—Pneumatic Tool Post.**

for several years. The time of changing tools in the lathe has been reduced from an average of five minutes to one minute, and, in addition to this, difficulties with broken studs and wrenches, etc., have been eliminated. The air cylinder which has a 5¼-in. stroke is fastened to the carriage by four long studs, 1½ in. in diameter.

The piston rod connects the two cam levers, which force the holder plates down on the tool. The four springs release the tool when the pressure is released from the cylinder. The tool holder shown in Fig. 226 is used with this device. The springs hold the tool-plate about ½ in. from the tool, allowing ample room for removal or adjustment.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

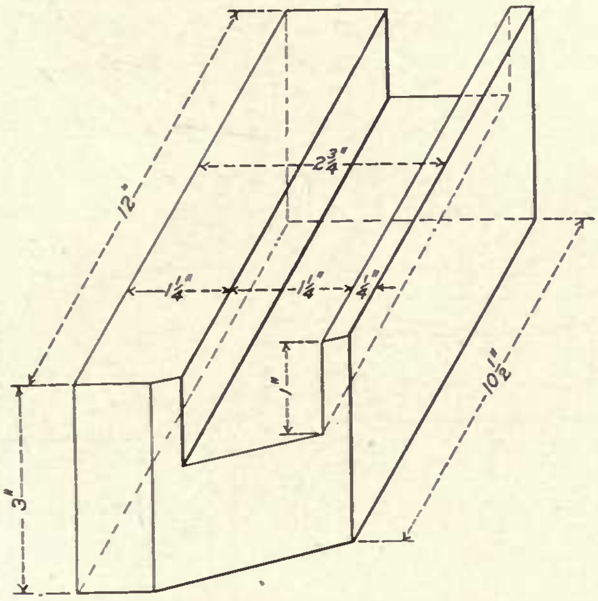


Fig. 226—Heavy Duty Tool Holder.

VALVE STRIP CHUCK, SLIDE.

A simple chuck for clamping slide valve balance strips for planing is shown in Fig. 227. The strip is clamped, as shown, so as to counteract, as much as possible, any tendency to spring. The hook-shaped clamps grip the ends of the strip and are tightened by the nuts on the under side. This chuck is light and easily made. The special tool holder for planing these strips is shown in Fig. 229.—*William G. Reyer, General Foreman, and J. W. Hooten, Foreman Repair Work, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

TOOL RACK FOR MACHINE TOOLS.

A neat and serviceable tool rack for use in connection with machine tools is shown in Fig. 228. The top and shelves are of ¼-in. steel plate, the uprights being ¾-in. rods with ¾-in. pipe spacers. The drawer is constructed of No. 8 steel. The shop is equipped with a number of these racks, or tables, which have been found very useful.—*Rock Island Lines, Silvis, Ill.*

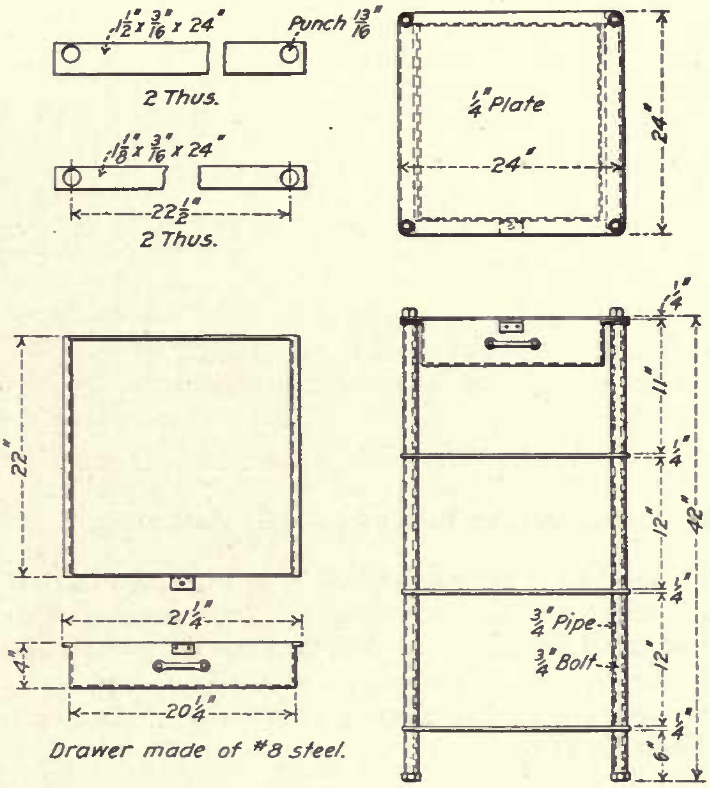


Fig. 228—Tool Rack.

VALVE STRIPS, TOOL FOR PLANING SLIDE.

The three-bar tool holder shown in Fig. 229 is for use on a planer with the chuck shown in Fig. 227. Two cutters are used for the roughing cut, machining

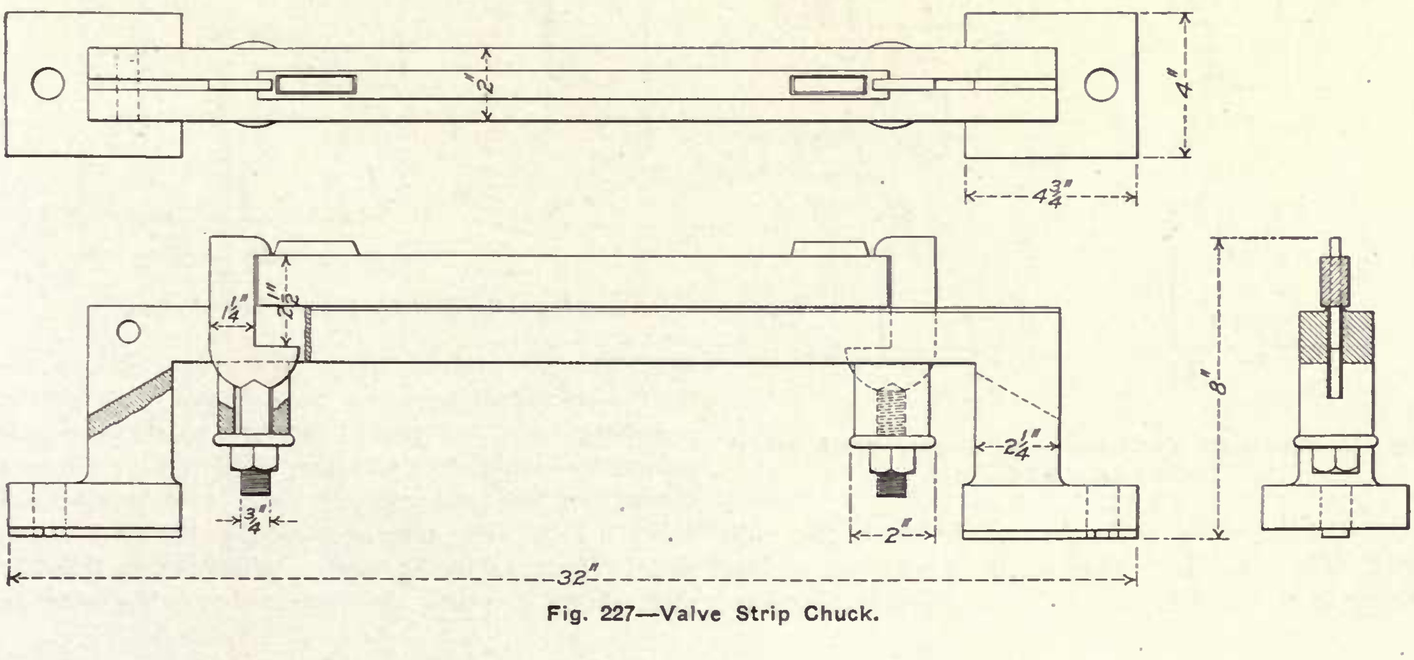


Fig. 227—Valve Strip Chuck.

both sides of the strip simultaneously, and one set of cutters is used for the finishing cut only in order to maintain a standard size strip. The tool holder is fastened

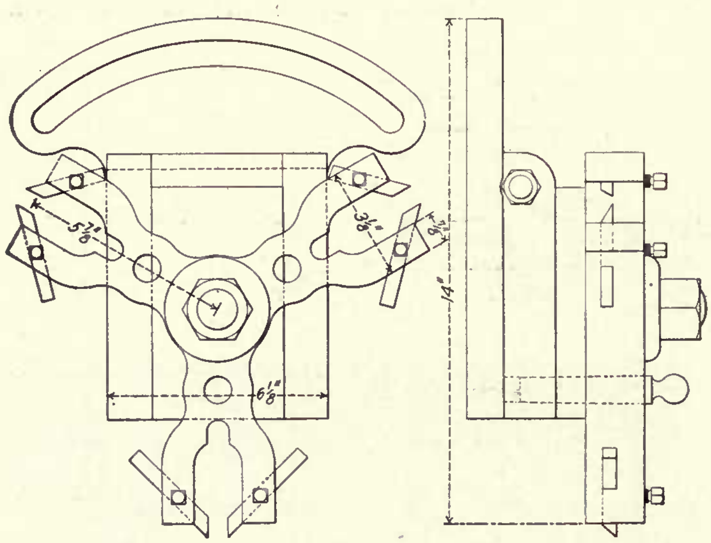


**Fig. 229—Tool Holder for Planing Valve Strips.**

to the plate of the clapper box by a bolt, and either set of cutters may be revolved into position quickly. This tool is a labor-saver and does accurate work.—*William G. Reyer, General Foreman, and J. W. Hooten, Foreman Repair Work, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

WHEEL CENTERS, BORING TRUCK.

Blocks for holding the truck wheel centers on a boring mill table are shown in Fig. 230. Four of these are fastened to the table by bolts through the flanges and are set in a circle 90 deg. apart. The tongues on the

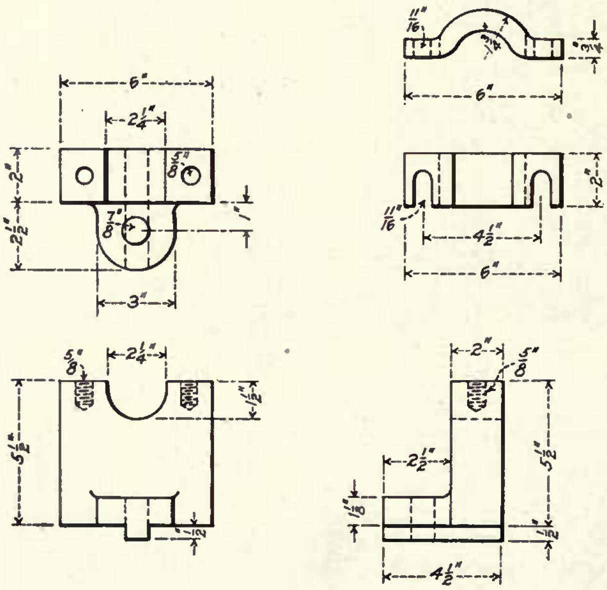


**Fig. 230—Blocks for Centering and Clamping Truck Wheel Centers on a Boring Mill.**

bottom of the blocks fit in the slots in the boring mill table. The wheel is dropped on the blocks, the spokes resting in the depressions, and is clamped to them by adjustable clamps which fit over the spokes. The wheel requires no further setting, as the blocks in which the spokes fit bring it central. Our wheels have eight spokes. For wheels having an odd number of spokes, or a number not a multiple of four, the block could be bolted in the proper position on a plate which could in turn be secured to the boring mill table.—*R. E. Brown, Foreman, Atlantic Coast Line, Waycross, Ga.*

VALVES, CUTTING PORTS IN SLIDE.

The ordinary method of cutting the ports in the valve faces is to notch out at each end of the port, as shown

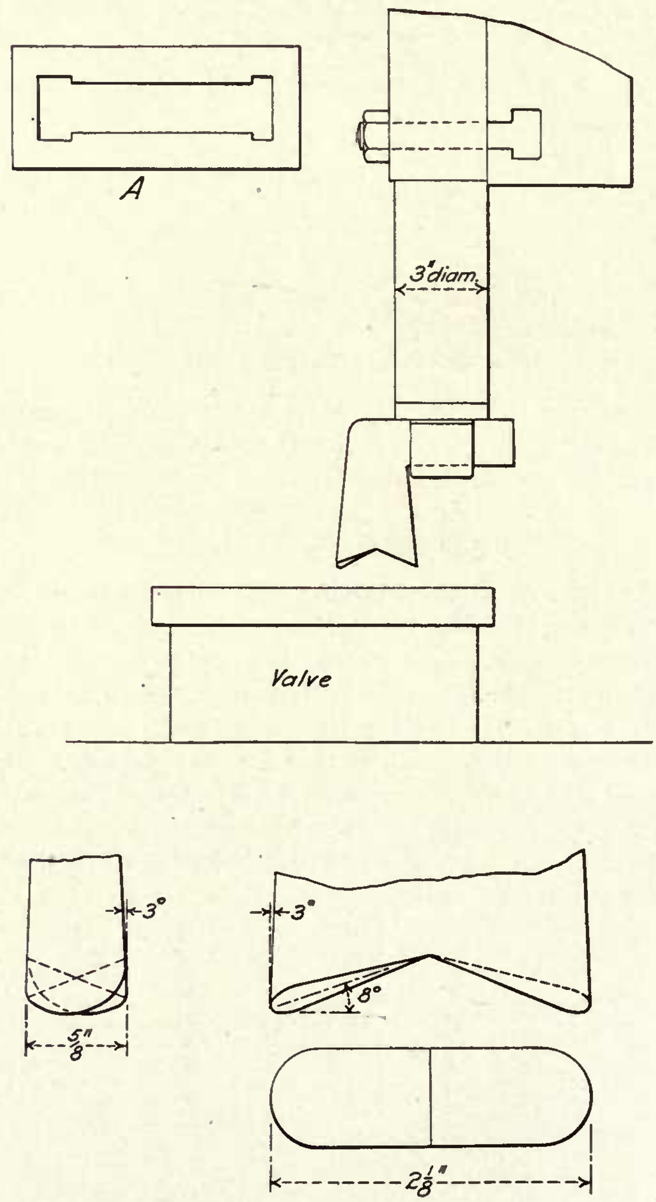



**Fig. 231—Tool for Porting Slide Valves.**

at *A*, Fig. 231, and then plane off the part between, the notches serving as points for the over-run of the tool in each direction. An improved method is to use the double pointed tool which cuts on either side. This is put in a slotting machine and cuts out about 1/16 in. of metal on each side. The time required for the work is ordinarily from 15 to 20 minutes, which is less than the time taken for cutting the four notches, while with the latter system from one-half hour to an hour is spent in finishing the valve on the planer.—*Frank Rattek, Brighton, Mass.*

WHEEL LATHE DRIVER.

The wheel lathe driver shown in the accompanying sketch, Fig. 232, is designed for use in turning steel tired

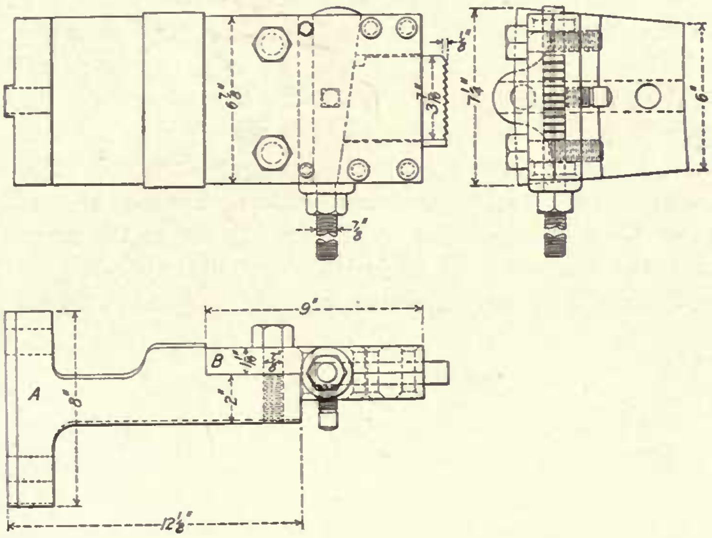


Fig. 232—Wheel Lathe Driver.

or rolled steel wheels. The bracket *A* is made of cast iron and is securely bolted to the face-plate of the lathe. Part *B*, made of steel and containing the toothed steel dog and key, is securely bolted to the cast iron portion of the driver. The dog is driven against the rim of the wheel by the key, which is actuated by the nut at its end. Six of these drivers constitute a set, three for each wheel.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

WHEEL LATHE DRIVER.

The old-style way was to drive the wheels with an arm bolted to the face plate. This is not satisfactory for the service now required of wheel lathes. Since we designed and made the improved drivers shown in Fig. 233 we have been using a set of them for two years. They can be adjusted easily to any size tire which is to be turned. The driving arm can swing backward and be locked in the spring clips when the wheels are being changed. The grips are made of tool steel and are hardened; they are held in position against the tire by a screw clamp, or jack, as shown. There are four drivers to a machine, two on each face plate, set about quartering, so when tire is being turned they help steady the driving wheel lathe under heavy duty.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

WHEEL LATHE TOOL HOLDER.

A wheel lathe tool holder, designed to use smaller and more efficient cutting tools than the old solid bar tools,

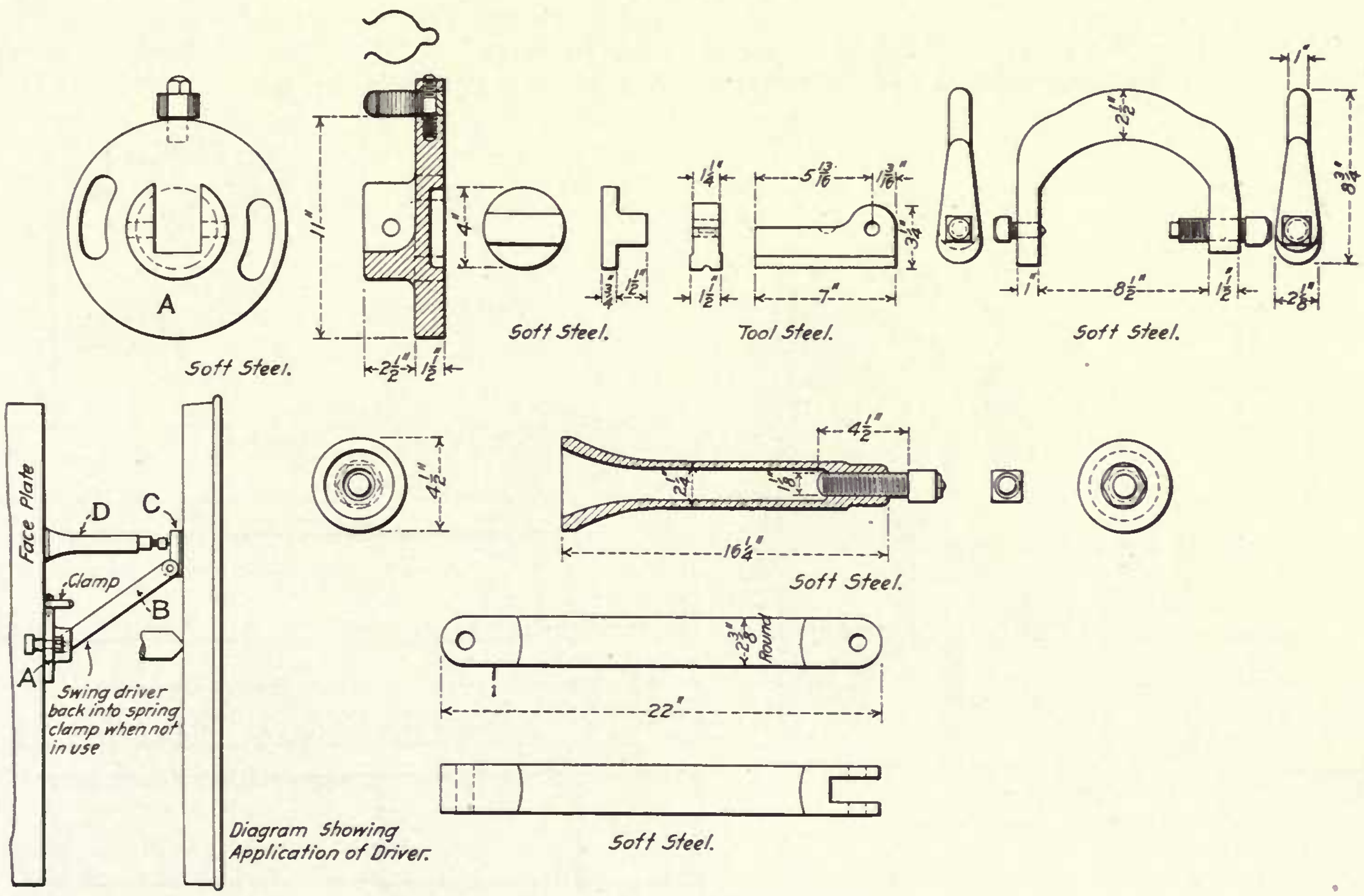



Fig. 233—Wheel Lathe Driver.

is shown in Fig. 234. The holders are made of cast steel and take 1¼-in. square high-speed roughing tools and ¾-in. flat flanging and finishing tools. The holders and tools are clamped in the tool posts in the ordinary manner. With the old-style solid tools each machine was equipped with a set of tools weighing from 125 to 150 lbs. By the use of the tool holder and smaller tools the amount of tool steel per machine has been reduced

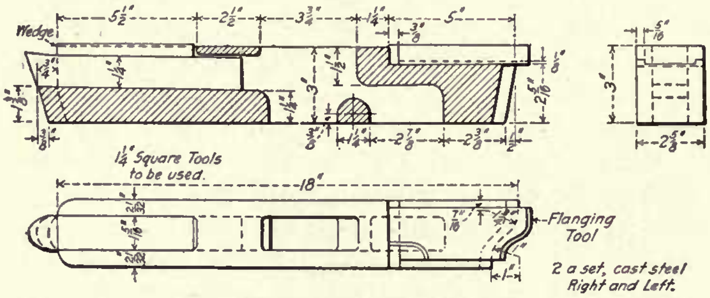



**Fig. 234—Wheel Lathe Tool Holder.**

from 150 to 20 lbs., or in cost from approximately $90 to $12. With 25 wheel lathes in operation the total saving in tool steel tied up for this purpose amounts to $1,950 per year. In addition to the great economy of the holder and smaller tools, the ease of forging and grinding make them much more satisfactory and convenient.—*E. J. McKernan, Supervisor of Tools, Atchison, Topeka & Santa Fe, Topeka, Kan.*

WHEELS, GAGES FOR MOUNTING ENGINE AND TENDER TRUCK.

The gages shown in Fig. 235 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 on the axle and the location of the flange when they are re-turned. The long gage *A* is really for the turning of the axles. Triangular holes are cut in the bar, with the bases of the holes the same distance apart as the ends of the wheel fits. This gage 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 is placed on the flange. The marking on the end of it where it abuts 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.—*Delaware, Lackawanna & Western, Scranton, Pa.*

WHEELS, TURNING STEEL TIRED.

Some time ago we installed a 42-in. Putnam coach wheel lathe in the Jackson Street shops. Great things were expected of it, for the makers claimed a record of something like 22 pairs of wheels in a 10-hour day. We managed to turn out seven pair a day, and sometimes eight, although this appeared to be the limit, owing to the fact that too much time was required for pulling the tailstock back and running it forward again after the wheels had been put in place. Often as much as 10 or 15 minutes was required for doing this. To remedy this difficulty we removed the hand rigging for doing this work and fitted up an air cylinder, as shown in Fig. 236. With this arrangement it was possible

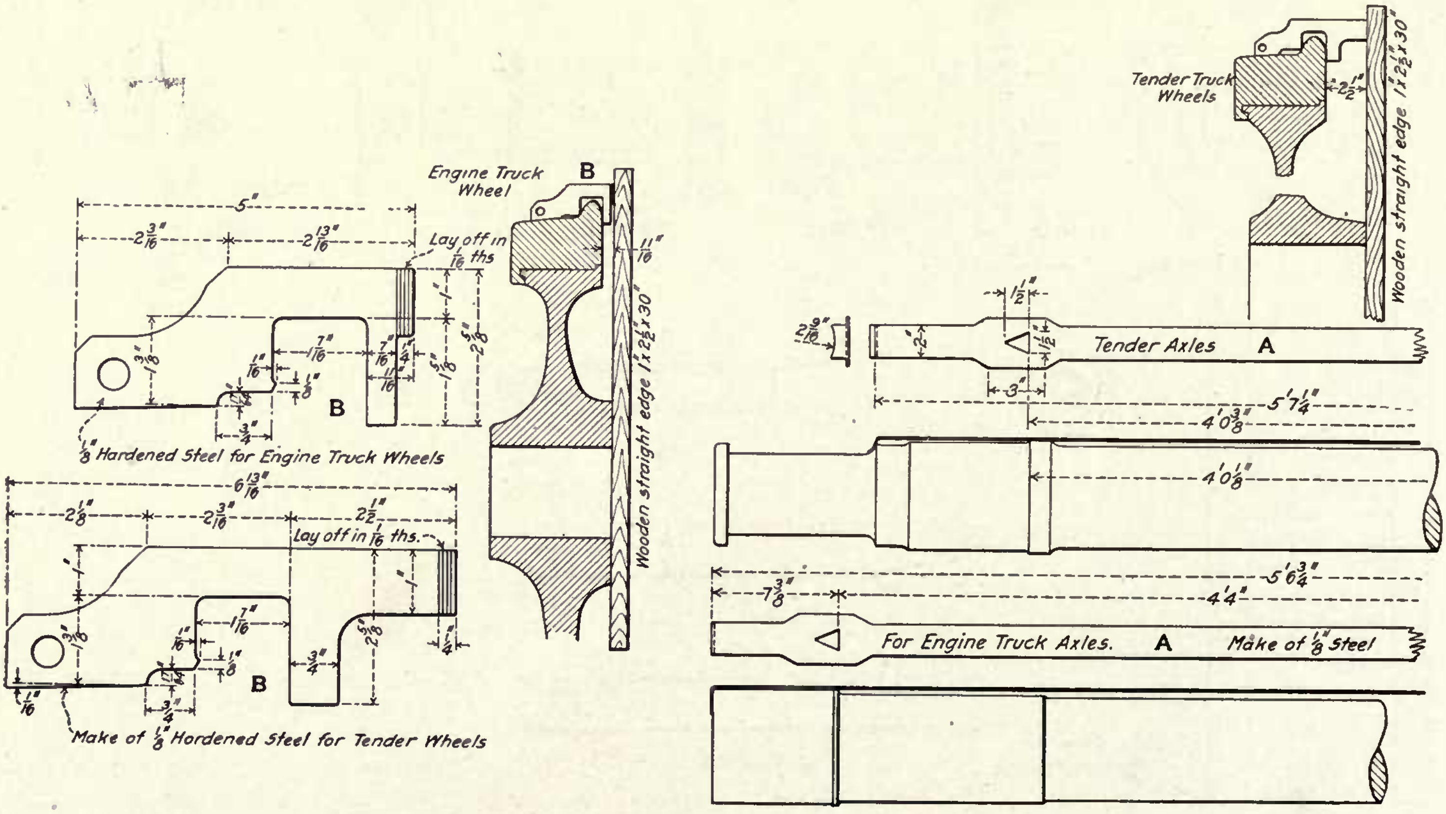



**Fig. 235—Gages for Mounting Engine and Tender Truck Wheels.**

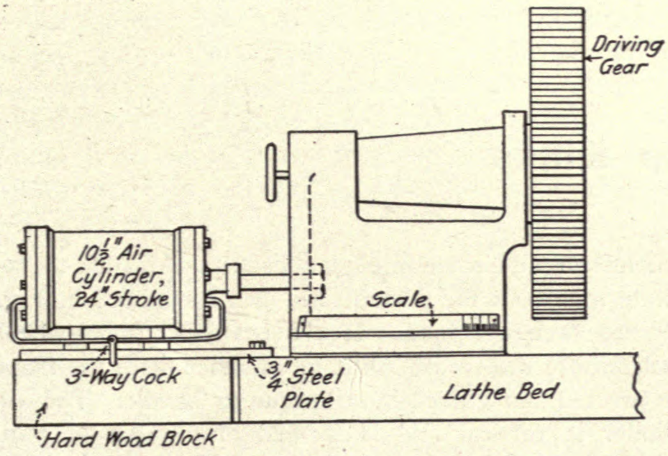



**Fig. 236—Application of Power Traverse to Tailstock of Car Wheel Lathe.**

to make the change in from two to two and a half minutes, thus allowing an output of from 12 to 13 pairs of wheels in nine hours. As may be seen, the air cylinder is mounted on a hardwood block, which is placed directly back of the base of the machine and is connected to it by the ¾-in. steel plate. By means of the three-way cock, air may be admitted to either end of the cylinder, enabling it to operate in both directions. We also made and applied a 48-in. scale on the side of the tailstock and in a location convenient to the operator. The scale is graduated in 1/16-in. for a distance of 24 in., so that the operator can readily set his calipers accurately. These appliances, from a practical standpoint, help greatly to make the machine up-to-date and modern.—*Theodore Rowe, Foreman, Great Northern, Jackson Street Shops, St. Paul, Minn.*

# Erecting Shop Kinks

AIR PUMP, JIGS FOR SETTING.

The two photographs, Figs. 237 and 238, show a set of jigs that are in use for setting air pumps on locomotives. The larger jig is used for marking and drilling the holes in the boiler for the bracket studs, and the

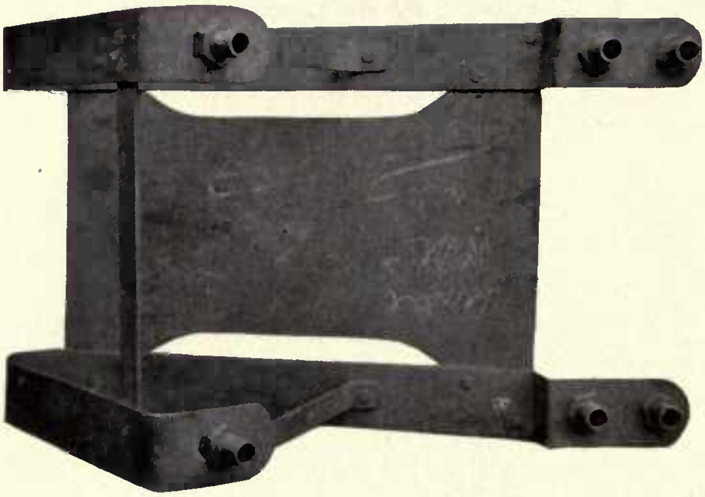


Fig. 237—Jig for Air Pump Bracket Studs.

smaller one 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

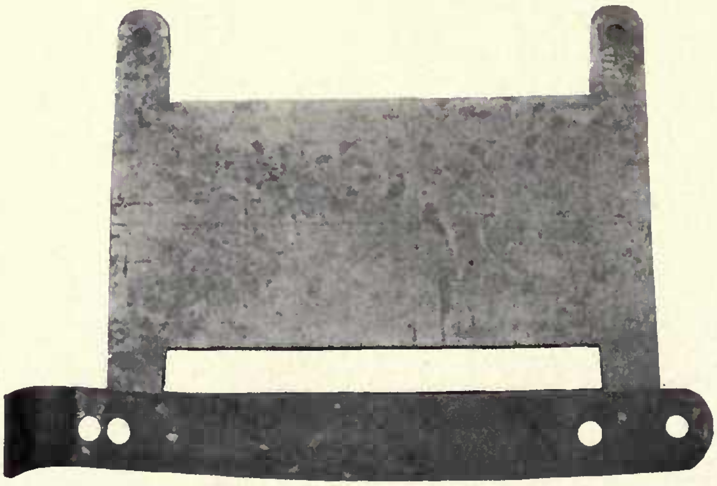


Fig. 238—Jig for Drilling Air Pump Bracket.

the photographs, but the dimensions and proportions will depend, of course, on the boiler and the location of the pump.—*Delaware, Lackawanna & Western, Scranton, Pa.*

AIR RESERVOIR HOIST.

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 Fig. 239 has been designed. It consists of a three-wheel truck, whose wheels are 10 in. in diameter, with the front one pivoted and guided by a tongue or handle. The air cylinder is vertical and is formed of a piece of 5-in. pipe, with heads bolted on. It is steadied by a triangu-

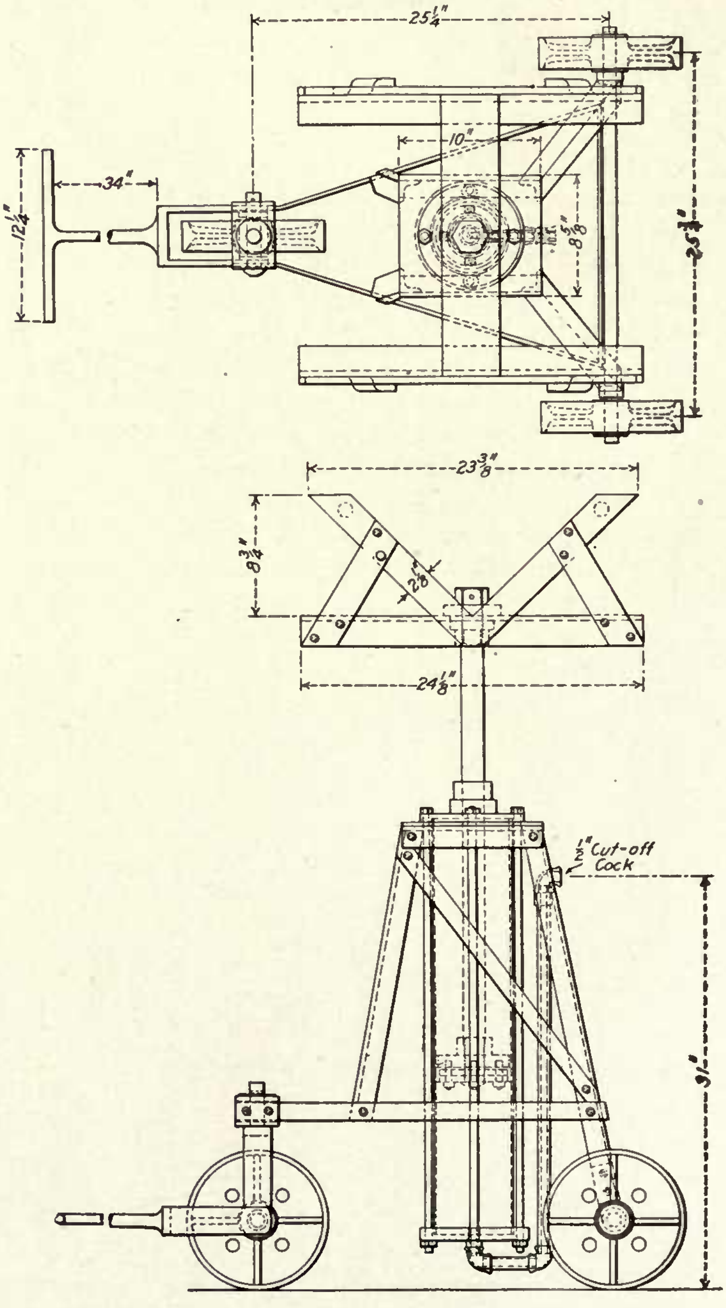



Fig. 239—Portable Air Hoist for Main Reservoirs.

lated framing of angles, and has a piston rod 1½ in. in diameter, the upper end of which carries a cradle adapted to hold a reservoir. Its use is evident. 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.—*Delaware, Lackawanna & Western, Scranton, Pa.*

AIR RESERVOIR, JACKS FOR PLACING.

Where small tanks or boilers are handled, such as the main reservoirs of locomotives, it will be found convenient to have jacks with adjustable heights. Two of these are shown in Fig. 240. The stem of the jack is threaded to fit the nut in the stand, which nut operates to raise or lower the jack. Where the arrangement is to be used for hoisting main reservoirs into place, the Y-shaped head is made separate and has a small stem that drops down into the head of the screw, as shown by the dotted lines in the drawing. With this jack, a reservoir may be raised and held in position while the fastenings are being adjusted.

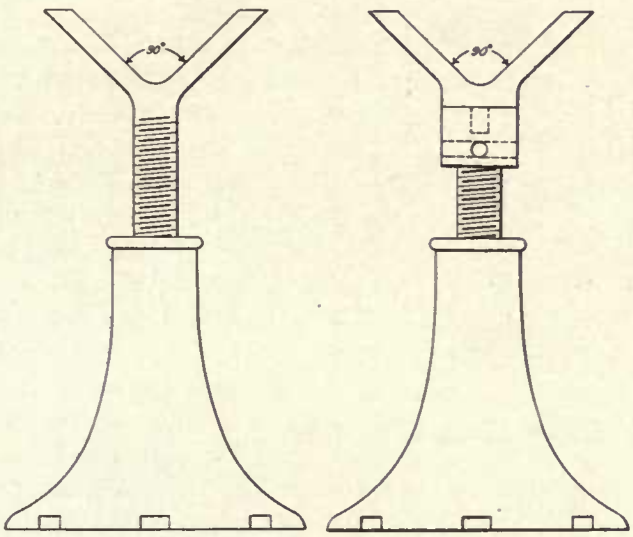


**Fig. 240—Reservoir and Tank Jacks.**

AIR RESERVOIR, JACK FOR PLACING.

A screw jack for raising locomotive air reservoirs into position is shown in Fig. 241. Close inspection reveals a large amount of necessarily accurate machine work, increasing the jack's first cost over one of simpler design, but the points of decided advantage which result would seem to offset the cost. The jack is mounted on four cast-iron wheels, the forward pair of which are mounted on a swiveling axle. The radius of the wrought iron stirrup on which the reservoir rests is 7 in., which provides for taking any reservoir in use. The 16-in. hand wheel rests on 17 ball bearings, ⅞-in. in diameter. These balls run on a ¼-in. steel liner, shaped to conform to the runway. The 2-in. diameter vertical steel screw is single square threaded, ½-in. pitch, for about 3 ft. 5 in. The screw permits a maximum lift of 2 ft. 9½ in., which is ample. The 1-in. diameter, horizontal steel screw is double square threaded, ½-in. pitch and is used for side adjustment, so that the reservoir can be shifted horizontally. The additional advantage which the ball bearings give in elevating a reservoir is emphasized by the fact that the weight of the screw and its stirrup is sufficient to cause the hand wheel to revolve and the screw to

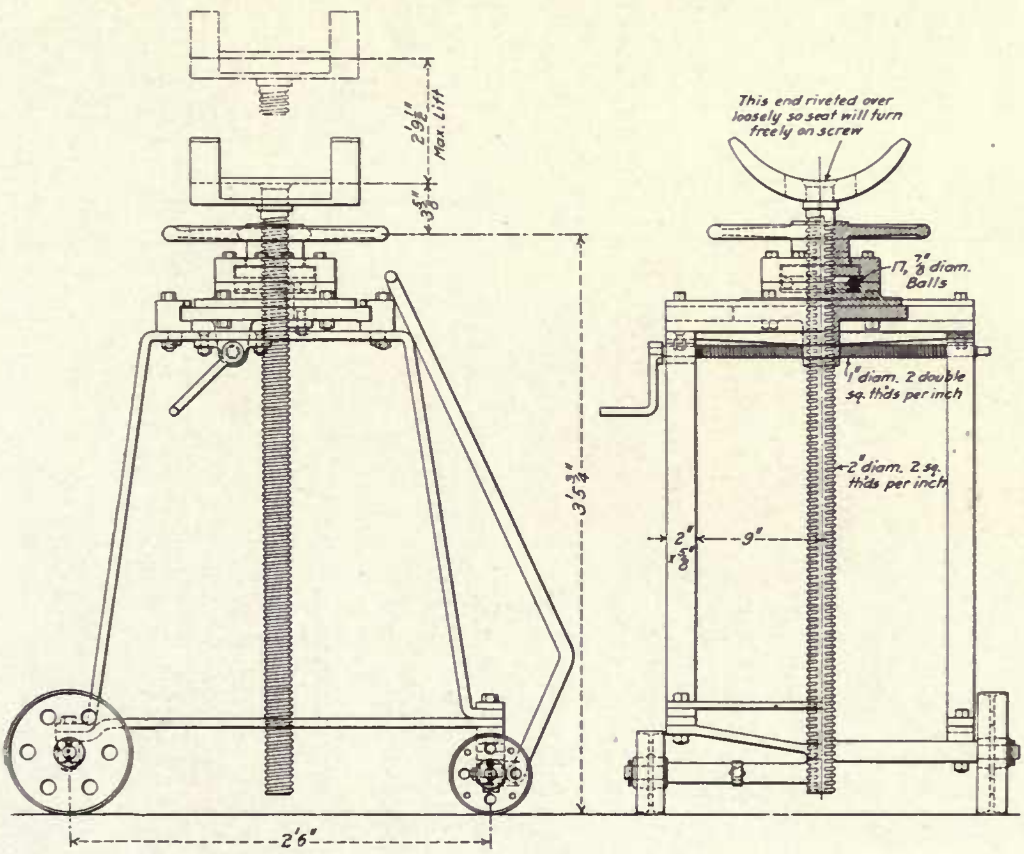


**Fig. 241—Screw Jack for Placing Air Reservoirs.**

descend. The collar plate, which holds the base flange of the hand wheel against the balls, is made in two halves.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### BELL FRAME, BORING BAR FOR.

It is the practice in many shops to remove the bell frames from the locomotive when they require re-boring and do the work on a drill press or a lathe. The details of a portable boring bar for this purpose, by which the frame may be re-bored without removing it from the locomotive, and which has been used to splendid advantage in a large locomotive repair shop, are illustrated in Fig. 242. A fourth-year apprentice can usually re-bore a frame in 1 hour and 15 minutes, including the time for setting up and taking down the boring bar; a first-class machinist can ordinarily do it in much less time. The caps shown in the upper left-hand corner of the illustration fit over the bosses on the frame, and may be adjusted for the proper alinement of the boring bar by means of the set screws. The caps are made of 5/16-in. boiler steel with ¼-in. plates brazed in the ends, to carry the bar bushings, which are of brass and are shown in the lower right hand corner of the drawing. The small handle is fastened to the top of the gear-case plates in order to steady the gear frame with one hand while the boring bar is being operated with the other. Just above the general view, showing the device applied to a bell frame, is a steel stud, a brass feed nut and, to the right of the nut, a peculiarly shaped piece of ¼-in. steel. The stud is screwed into the cap on the bell frame at the left and holds the piece of ¼-in. steel, which fits down over the slot in the feed nut on the end of the boring bar, thus providing for the feed while the bar is in operation. The three driving gears are of steel and have 16, 28 and 36 teeth, respectively.—*M. H. Westbrook, Battle Creek, Mich.*

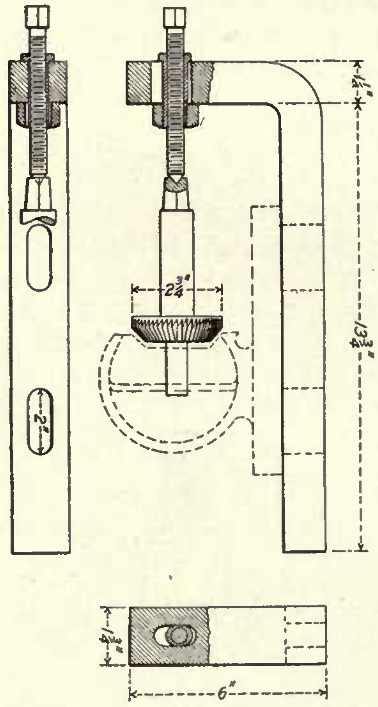


Fig. 243—Reseating Boiler Check.

### BOILER CHECK, RESEATING.

An effective device for reseating boiler checks is show in Fig. 243. The brace, made of 1¼-in. x 1¾-in. soft steel, is clamped in a bench vise. The boiler check body, shown dotted, is then fastened to the brace through holes in the casting and the slots in the brace. The tool steel reamer is put in position and adjusted by the screw, which is later clamped in position by the lock-nut. The

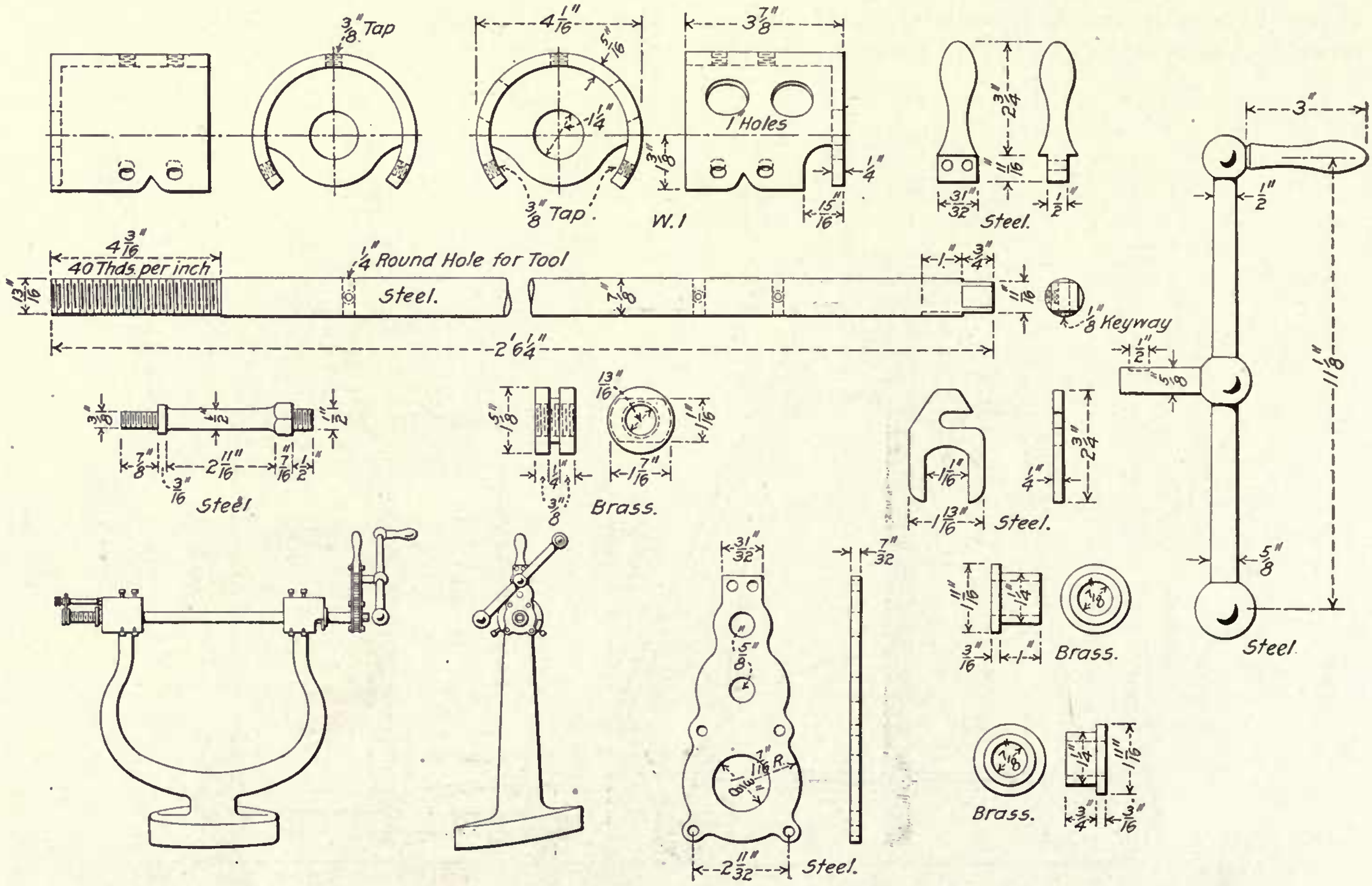



Fig. 242—Details of Portable Boring Bar for Re-boring Locomotive Bell Frames in Place.

slotted hole in the top of the brace allows for the vertical adjustment of the reamer which is revolved by using an ordinary wrench.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### BOLTS, GUN FOR DRIVING OUT.

The gun, shown in Fig. 244, is convenient for driving out broken frame bolts, or bolts in any other part of the locomotive which cannot be driven out with a hammer and would otherwise have to be drilled out. For instance, consider the taking out of broken equalizer bolts. These are often broken and are so located that it is impossible to get at them with a hammer. On some classes of locomotives the brackets which support the driving brakes are so placed that it is impossible to drill

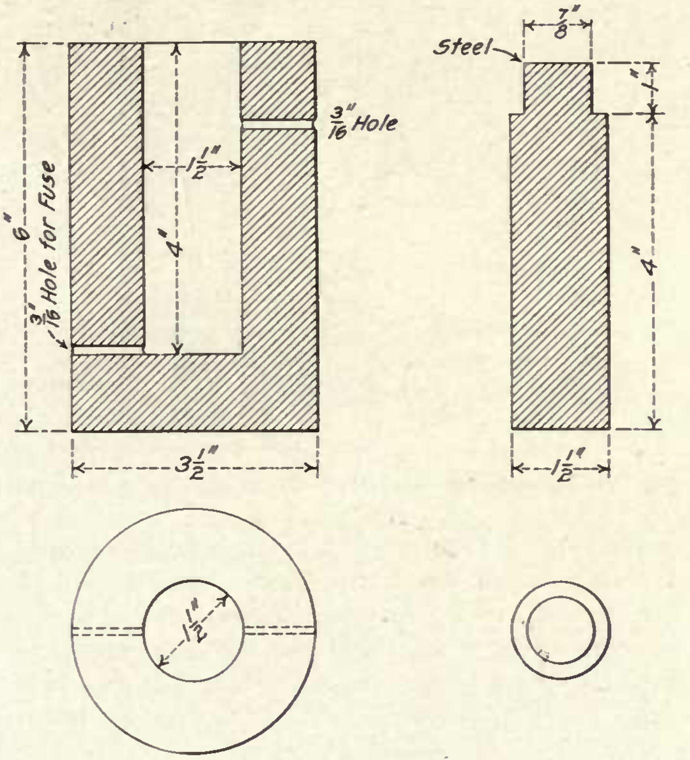



Fig. 244—Gun for Shooting Out Frame and Equalizer Bolts.

the bolts out without removing the driving brakes and bracket. If the gun is given a small charge of powder, and is placed fairly under the broken bolt, it can easily be driven out. The gun is loaded much the same as one of the old muzzle-loading shotguns, the fuse being placed in the 3/16-in. hole near the bottom. It is advisable to get out of the way while it is exploding. It saves more time than any device I know of, as engines often arrive with broken equalizer bolts which can be knocked out with the gun and put back into service inside of two hours, whereas from 15 to 20 hours would be required to take down the driver brake and drill out the hole.—*F. Nowell, Locomotive Foreman, Canadian Pacific, Ottawa, Ont., Canada.*

### BOLT EXTRACTOR.

The extractor shown in Fig. 245 is used for removing bolts from locomotive frames, and is one of the most useful tools in the shop. It is made of an old crank pin machined as shown in the sketch. The barrel is filled with thick oil, the plunger being withdrawn to its full back position before filling. The 3-in. ram is securely placed under the bolt to be removed. The screw forces the oil in the cylinder against the ram. A small

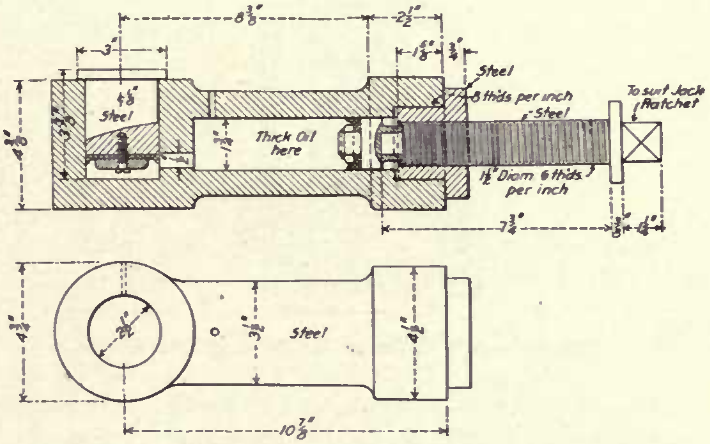



Fig. 245—Bolt Extractor.

hole is provided near the top of the plunger to prevent its being moved beyond the bore.—*A. D. Porter, Shop Efficiency Foreman, Canadian Pacific, West Toronto, Canada.*

### BOLTS, PNEUMATIC HAMMER FOR DRIVING OUT.

The air hammer for driving out bolts, Fig. 246, is giving good satisfaction at our engine house. It consists of a piece of pipe, 3⅛ in. inside diameter, with a cap at its lower end. The plunger can be projected with considerable force by properly manipulating the ¾-in. three-way cut-out cock. It is short and can therefore be

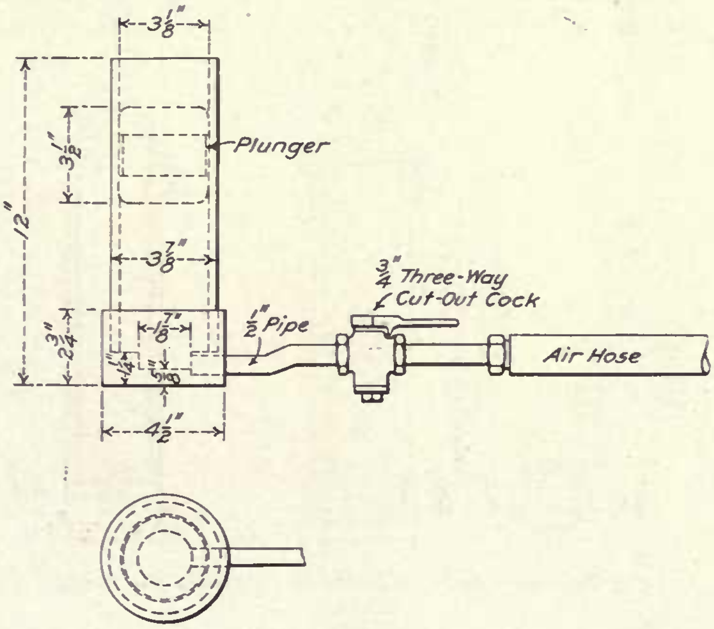



Fig. 246—Pneumatic Hammer for Driving Out Bolts.

used in restricted places. It also has the advantage of being safer than guns using powder.—*Richard Beeson, Roundhouse Foreman. Pittsburgh & Lake Erie, McKees Rocks, Pa.*

BOLTS, PNEUMATIC HAMMER FOR DRIVING OUT.

The air hammer for driving out bolts, shown in Fig. 247, consists of a cylinder 6 in. in diameter, into which is fitted a piston with packing grooves and a 3½-in.

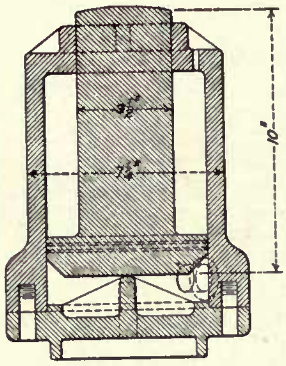


**Fig. 247—Air Hammer for Driving Out Bolts.**

piston rod. Air is admitted to the bottom by suddenly opening the air cock in the pipe connection, thereby giving the piston the necessary impulse.—*A. Lowe, Canadian Pacific Railway, Glen Yard, Westmount, Montreal.*

BOLTS, PNEUMATIC HAMMER FOR DRIVING OUT.

A telescopic pneumatic hammer which has given most satisfactory results is shown in Fig. 248. This hammer has proved a time-saver, not only for knocking out bolts from the frames of locomotives, but for knocking out crown-bar bolts, effecting a saving alone on this one job of 200 per cent. To operate the hammer after the air hose has been connected and the hammer has been mounted on substantial blocks, open the lower cock. This admits air under the telescopic cylinder and holds the punch on the object to be knocked out. Then open the top cock quickly. This will admit air through the

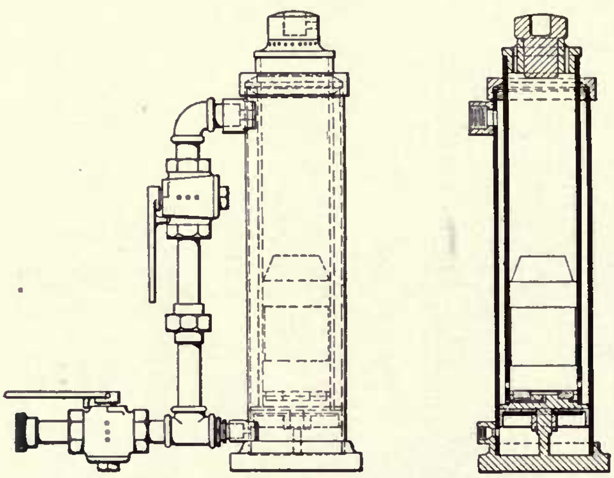


**Fig. 248—Pneumatic Hammer for Driving Out Bolts.**

⅛-in. holes in the telescopic cylinder, causing the hammer in that cylinder to lift and hit a very hard blow. Shut off the cock and release the air, which exhausts through the holes in the sides of the cock. The hammer will then drop on the rubber seat which acts as a cushion. The hammer will hit as fast as the operator can work the cock. The weight of the hammer is 24 lbs.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

BOLTS, PNEUMATIC HAMMER FOR DRIVING OUT.

The pneumatic hammer shown in Fig. 249 is especially useful for removing main rod and frame bolts. Air is admitted through the valve *A*, under the telescopic piston, forcing the head against the bolt. By alternately opening and closing the valve *B* air is admitted and

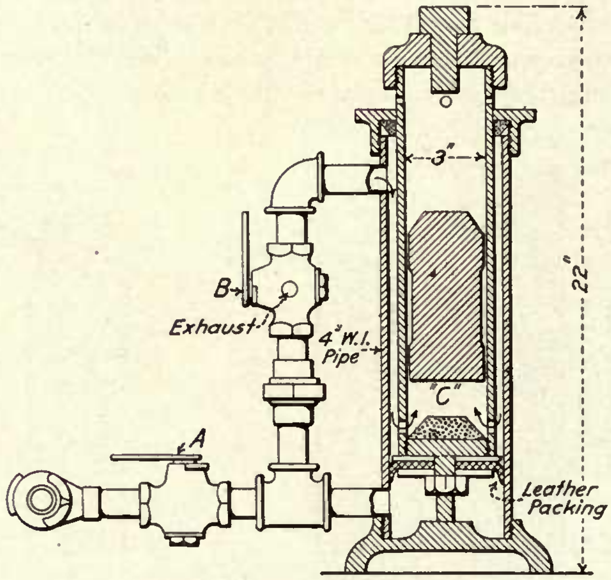



**Fig. 249—Pneumatic Hammer for Removing Frame Bolts.**

exhausted from the cylinder *C*, projecting the hammer against the anvil, which is in contact with the bolt. This hammer will strike a blow varying from 800 to 1,000 lbs. A great saving is made in both time and material, as a bolt is very seldom damaged when removed in this way.—*A. S. Willard, Foreman, Norfolk & Western, Crewe, Va.*

BY-PASS VALVE SEAT REAMER.

A built-up reamer for trueing up the bevel seats of by-pass valves is shown in Fig. 250. The spindle, which receives the cutters, thimbles, guides and nuts, is made of

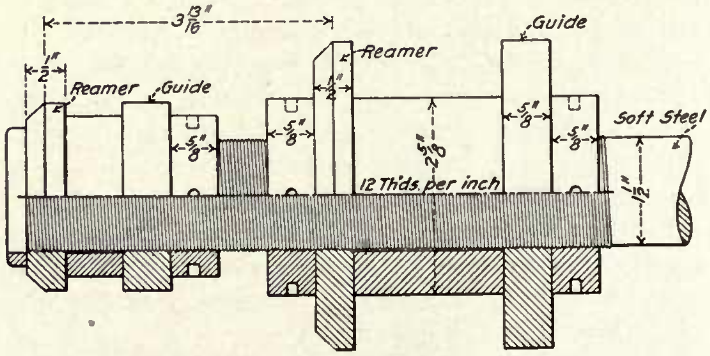



**Fig. 250—By-Pass Valve Seat Reamer.**

soft steel. The lower end of the spindle has a washer, machined in place, against which the lower cutter rests. The lower guide is separated from the reamer by a thimble, and the three are secured in position by the ring nut which bears against the guide. The upper cutter and guide are similarly clamped in position, there being two ring

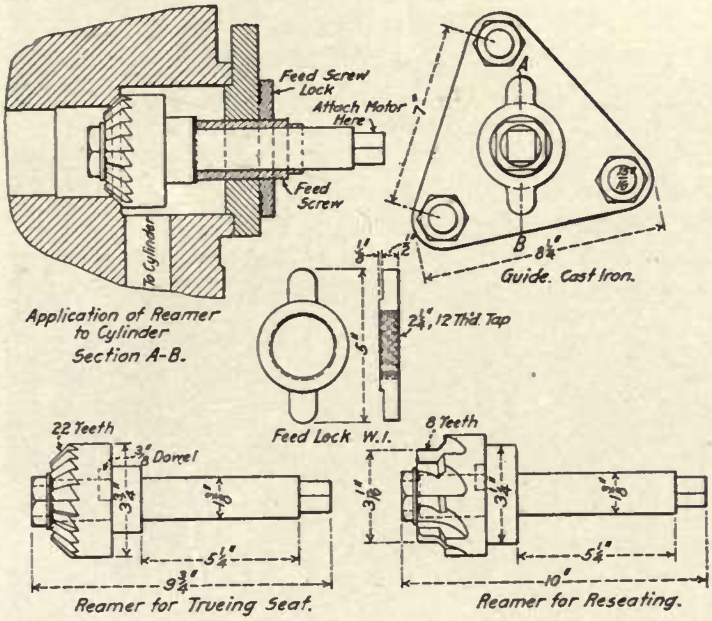



**Fig. 251—By-Pass Valve Seat Reamers.**

nuts which allow for adjustment of the cutters. The tool is designed for use with an air motor, the top of the spindle having a standard Morse taper.—*Erie Railroad, Meadville, Pa.*

### BY-PASS VALVE SEAT REAMERS.

Two styles of reamers and their application in reaming by-pass valve seats are shown in Fig. 251. To do this work satisfactorily two reamers are required, one of which is called the reseating reamer, which provides the correct width, while the other reamer is a finishing tool. Care should be taken that the width of the seat in the casting is smaller than the cutting edge of the valve. A slow running motor may be applied for power, but a good ratchet is satisfactory, especially when a workman has but one engine on which to do this work.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and C. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

### CRANK AXLE TURNING MACHINE.

A crank axle turning machine for truing up the inside crank axle bearings of balanced compound loco-

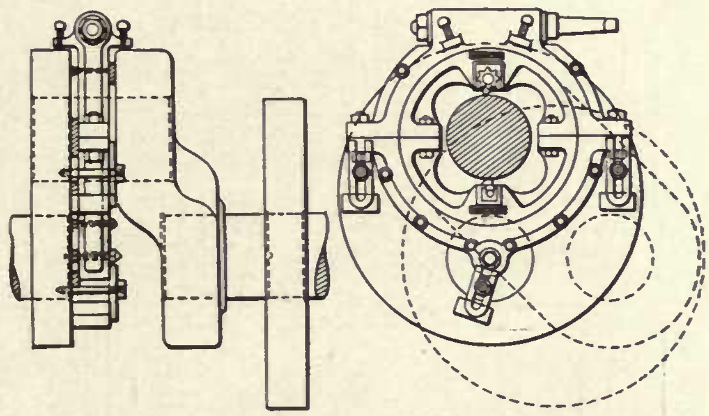


**Fig. 253—Crank Axle Turning Machine.**

motives is shown in Figs. 252 and 253. These bearings wear out or round more rapidly than the outside

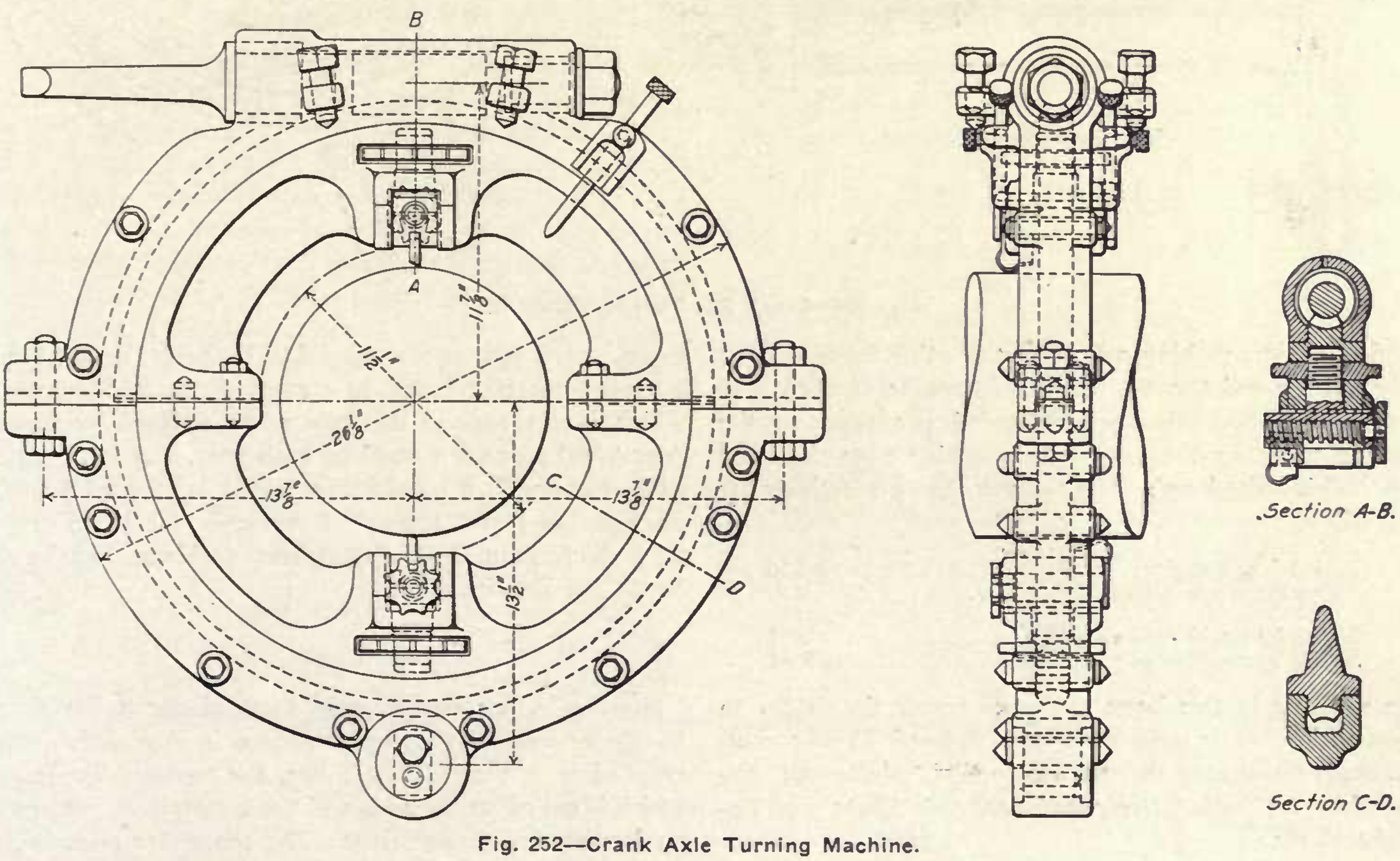



**Fig. 252—Crank Axle Turning Machine.**

pins and must be maintained in good condition to prevent overheating and failure. Maintaining the bearings by hand is costly and unsatisfactory. It requires a skilled mechanic from 25 to 30 hours to true up a crank axle bearing by hand, and when finished the crank is liable to be out of quarter and the original throw changed. The crank axle turning machine will finish a bearing in from five to six hours, turning the pin exactly round and in exact quarter and throw. The drawings show the construction of the machine. It consists of a two-piece annular worm gear enclosed in an outer case. An air motor drives this gear by means of a worm. Two cutting tools are mounted in the gear body and are fed automatically. The machine has a positive centering device, making adjustment on the crank correct for quarter and throw. The inside cranks of about 150 balanced compounds are overhauled per year, so the saving made by the use of the machine over the hand method is quite large. The costs of the two methods are as follows:

| | |
|---|---|
| By hand, per engine........................ | $11.10 |
| By machine, per engine...................... | 2.59 |
| Saving by machine, per engine................ | 8.51 |
| Saving by machine, per 150 engines........... | 1,276.51 |

In addition to this large saving per year the delays to power for crank axle work are reduced 75 per cent. through the use of the machine.—*E. J. McKernan, Supervisor of Tools, Atchison, Topeka & Santa Fe, Topeka Shops.*

CRANK PIN TURNING MACHINE.

The machine shown in Fig. 254 is designed for returning side and main rod crank pins which have become untrue in service. It consists of an outer frame with an interior mechanism for driving two turning tools. The frame has points for adjusting the machine to the centers of the axle and pin, in order to correctly establish its position. The tools are driven by an air motor through gearing independently of each other, and are fed automatically. The machine is adjustable to all sizes of pins. With the machine one man can turn up and finish a crank pin in about 3½ hours, at an average cost of $1.14. By hand, with chisel and file, it requires a skilled mechanic on an average of 9 hours to true up a pin, at a cost of $3.60. With the machine the pins are round and in correct throw and quarter, which is not usually the case when finished by hand. About 300 pins are turned up each year, and at the rate of $2.46 per pin a considerabe saving is effected by the machine, and the quality of work is far superior.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

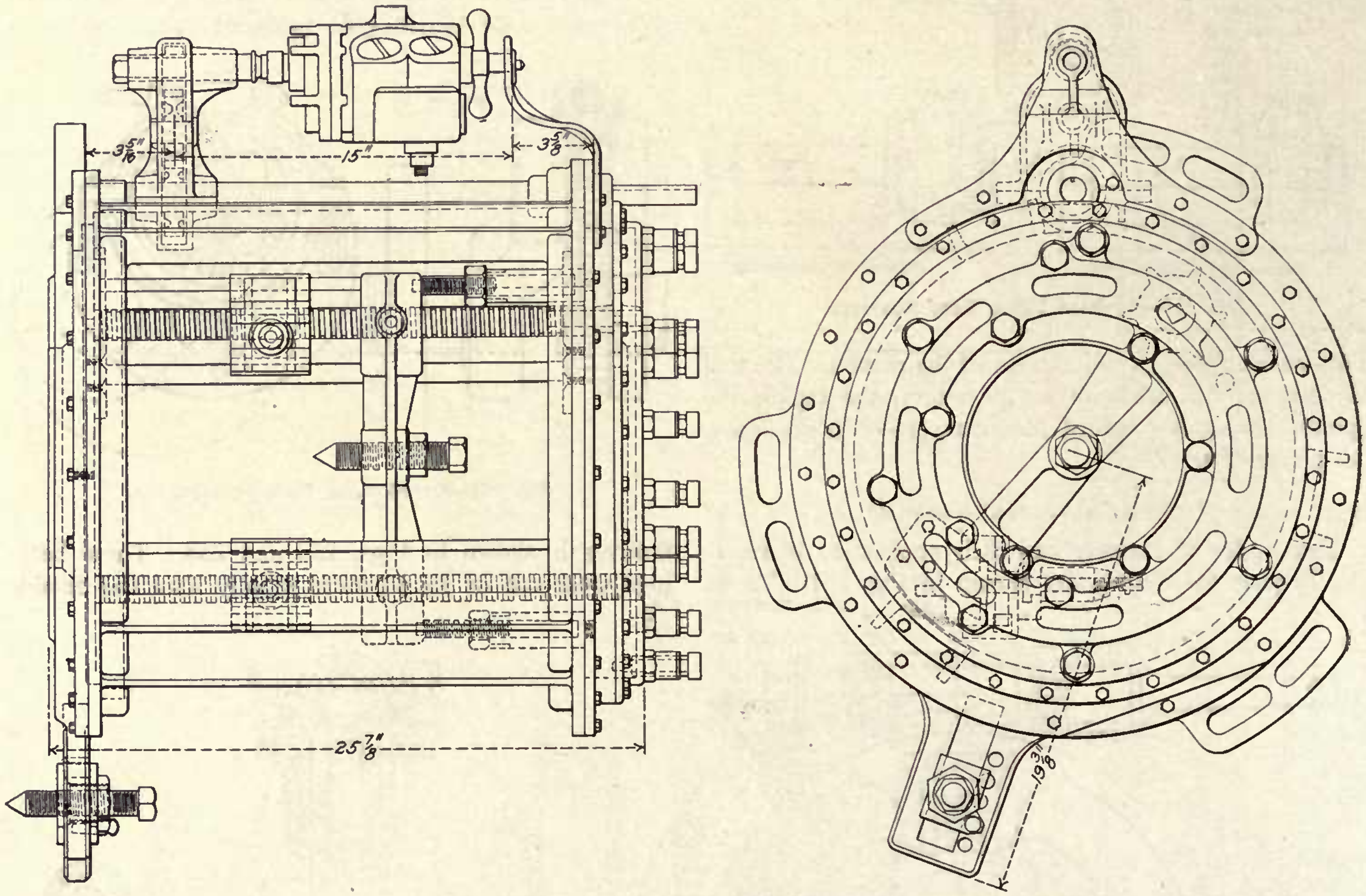



**Fig. 254—Crank Pin Turning Machine.**

CABS, HANDLING.

Steel cabs are conveniently handled about the shop by the crane and the device shown in Fig. 255. The cross-piece is made of a T-bar, the vertical flange of which is cut off at the ends and the bottom web is turned up for the chain connections. The triangular arms hook

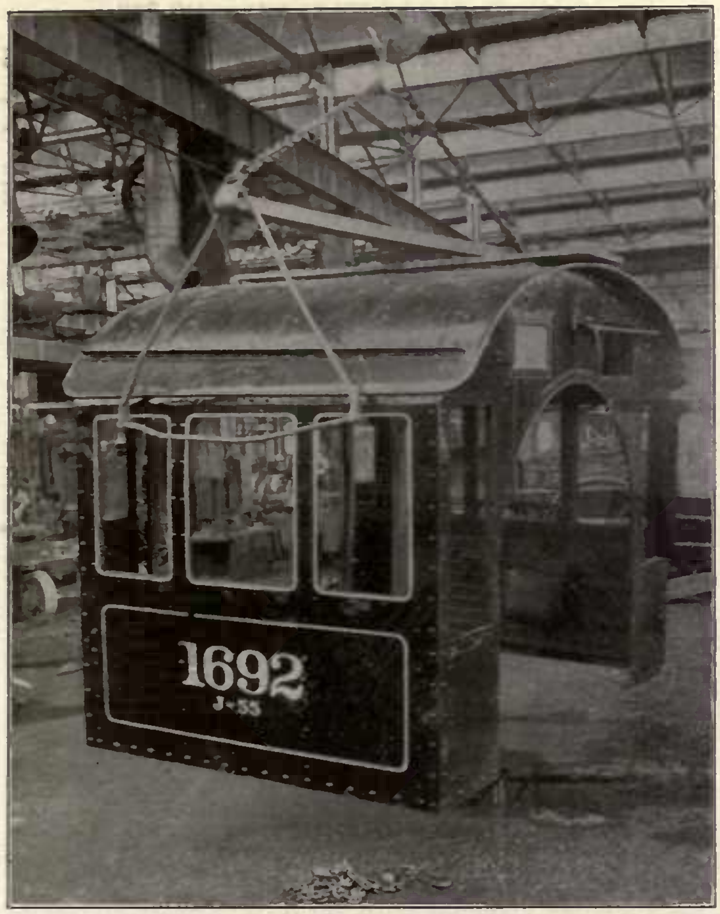



Fig. 255—Device for Handling Steel Cabs.

in the windows and provide for handling a cab without injury to the newly painted and varnished surfaces.—*Lehigh Valley, Sayre, Pa.*

#### CYLINDER BORING BAR.

The boring bar shown in Fig. 256 may be used for either cylinders or piston valve chambers. It is operated by an air motor, the spindle being geared to the main shaft of the motor. The feed is operated through the 15/16-in. diameter lead screw, actuated by the star wheel. The bar is held in position by the two heads which have shoulders to fit the bore of the piston valve chamber or cylinder. These heads are clamped to the cylinder.—*K. J. Lamcool and J. S. Naery, Jr., Special Apprentices, Chicago, Indiana & Louisville, Lafayette, Ind.*

#### CYLINDER CASTINGS, LAYING OUT.

A templet for laying out cylinder castings for planing is shown in Fig. 257. The false center *A* is placed in the end of the cylinder, with the templet *T* pivoted to it at the center *B*. The templet is then adjusted so that there is stock outside of it at all points where the cast-

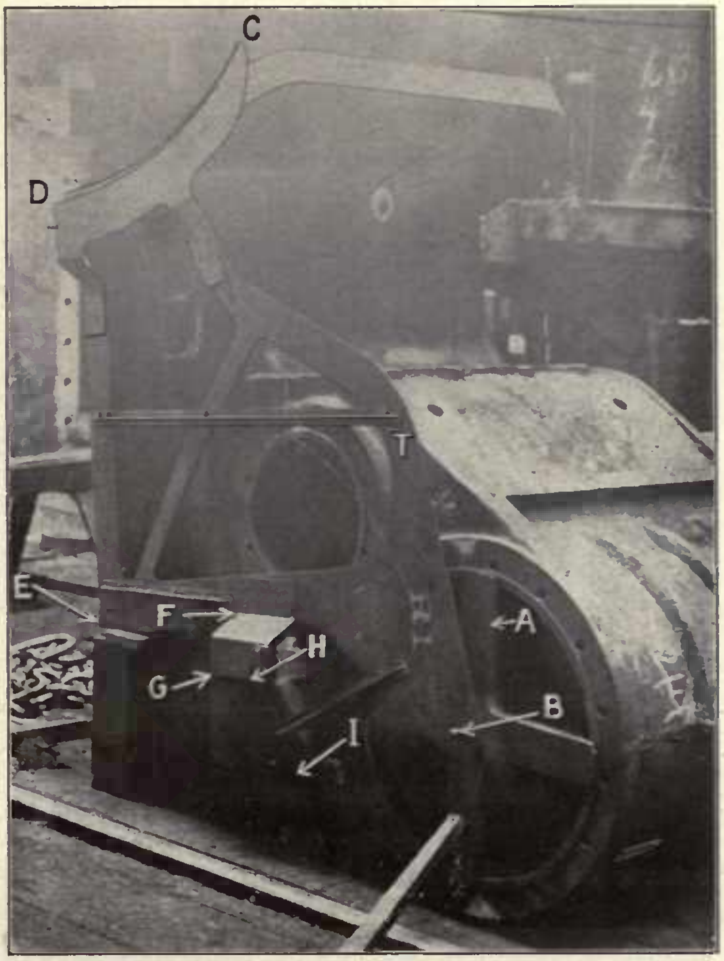



Fig. 257—Templet for Laying Out Cylinder Castings.

ing is to be machined. This being done, the cylinder casting is laid off according to the outline *C, D. E, F, G, H and I.—Chicago & North Western, Chicago.*

#### CYLINDER HEAD GRINDING.

The tool or jig for grinding cylinder heads, shown in Fig. 258, can be made for $2.25, labor and material. In some of the larger shops air motors are used for grinding cylinder heads, but this device has been found far superior and much cheaper. A 4-in. pipe is screwed into a casting 1¼-in. thick (something similar to a follower plate) with an air inlet at the bottom. The piston is made of hard wood. The admission of air to the cylinder is controlled by the three-way cock. A

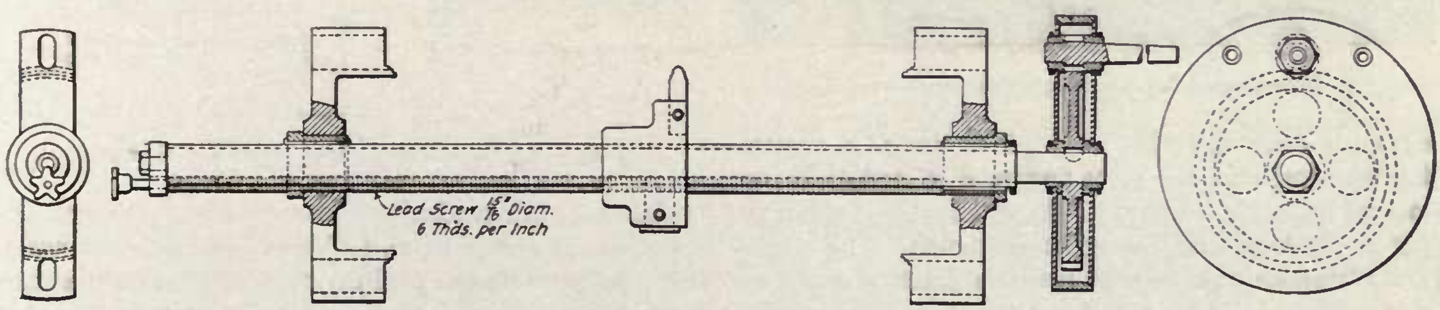



Fig. 256—Boring Bar for Cylinders or Piston Valve Chambers.

rod connects the handle of this cock with the arm attached to the cylinder head. All that is necessary is to turn on the air, which will start the piston upward until such a time as the connecting rod shuts off the admis-

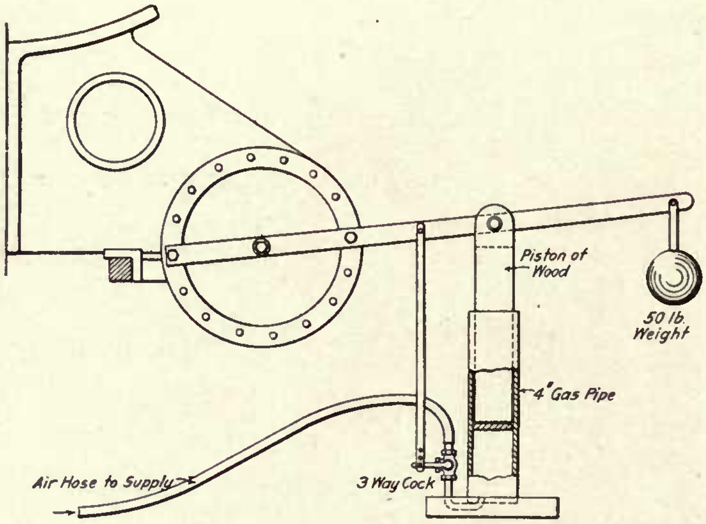



**Fig. 258—Device for Grinding Cylinder Heads.**

sion of the air, when the weight on the end of the lever quickly forces the piston downward. The device is thus automatic in action.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.*

CRANK PIN WEAR INDICATOR.

A special tool that readily indicates whether or not a crank pin is out of round is shown in Fig. 259. The

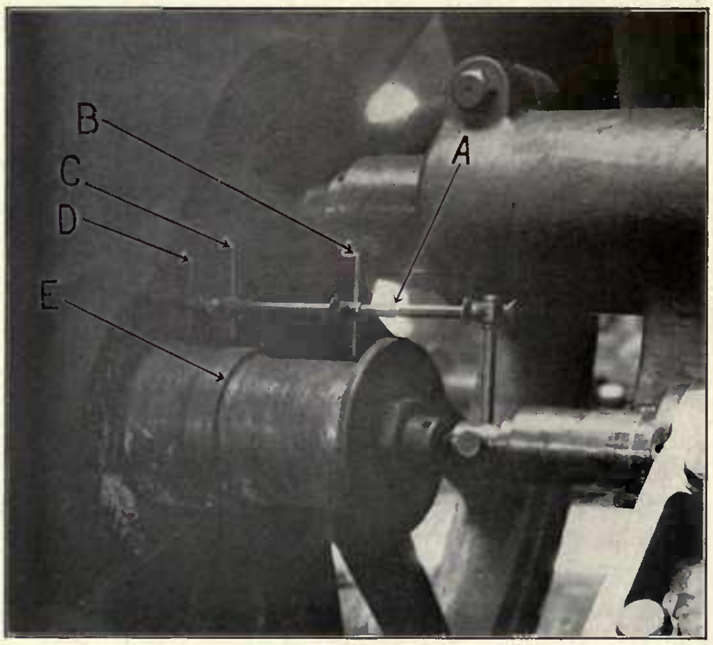



**Fig. 259—Device for Locating Wear on Crank Pins.**

device is fastened in the crank pin center of a quartering machine, with the three fingers *B*, *C* and *D* in contact with the pin, as shown. As it is revolved about the pin *E* the high and low spots are noted. The fingers are adjustable and may be used on crank pins of any size.—*Chicago & North Western, Chicago.*

CYLINDER SADDLE BOLT HOLES, JIG FOR.

A full set of cylinder saddle bolt holes may be drilled in three hours by means of the jig shown in Fig. 260. As indicated, they are drilled from the inside, the former practice at Silvis being to do it from the outside. The frame of the jig is constructed of four pieces of

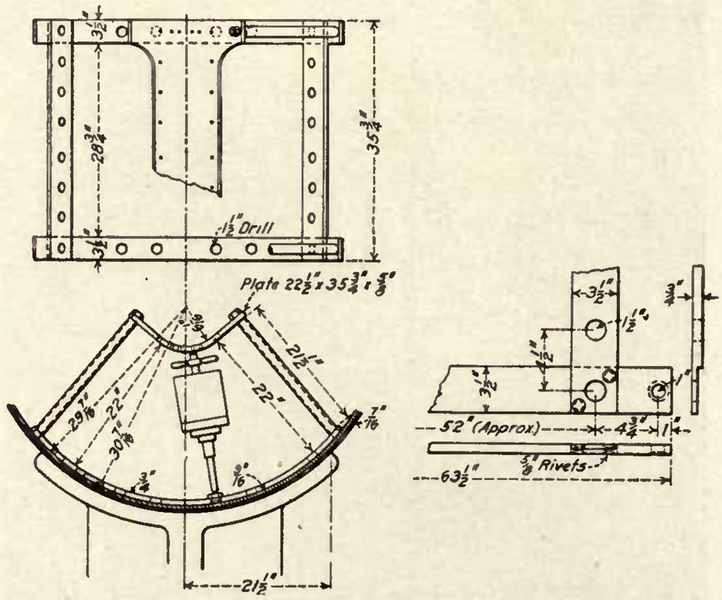



**Fig. 260—Jig for Boring Cylinder Saddle Bolt Holes.**

¾ x 3½-in. common iron and a 22½ x 35¾ x ⅝-in. plate, the plate being fastened to the base by long bolts and pipe spacers, as shown. Hardened steel bushings, 1½ in. outside diameter, are provided to guide the drill. —*G. W. Seidel, Shop Superintendent, Rock Island Lines, Silvis, Ill.*

CYLINDER, REPAIRING CRACKED.

When a cylinder casting cracks in the live steam passage between the steam pipe joint and the valve chamber, allowing the steam to escape from the live steam passage, the half cylinder saddle is useless. The accompanying drawing, Fig. 261, illustrates a method of

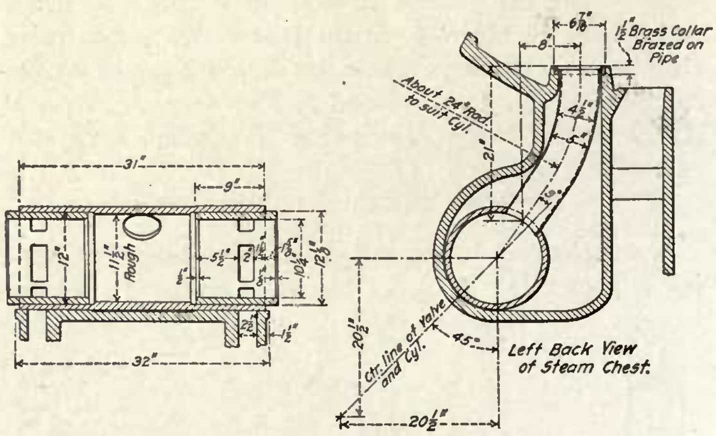



**Fig. 261—Sections of Cylinder Saddle and Bushings.**

reclaiming such cracked cylinder castings. The first application was made by G. L. Van Doren, superintendent, Elizabethport shops, in February, 1907, and this was probably the first application of its kind. Since that time 61 pairs of cylinders have been repaired in this way at Elizabethport, none of which have given any trouble. The saddle casting shown is that of an inside admission valve, with two short valve bushings. When the crack occurs in the live steam passage between these bushings, the steam must be carried direct from the steam pipe to the valve chamber, relieving the cracked cylinder of all steam pressure. The short bushings are removed, the valve chamber is rebored to receive a ⅞-in. thick bushing which extends over the outside edges of both steam ports. Steam ports are cut in this long bushing and the short bushings are replaced. A 5-in. diameter hole is bored in the long bushing, in which the 5-in. seamless steel tube is rolled with a specially made roll expander. The upper end of the tube has a ring brazed to it, which fits snugly in the steam pipe casting as shown.—*Central Railroad of New Jersey, Elizabethport, N. J.*

CYLINDERS, HANDLING.

A pair of locomotive cylinders being handled by an overhead traveling crane is shown in Fig. 262. Advantage is taken of the cylinder design which permits

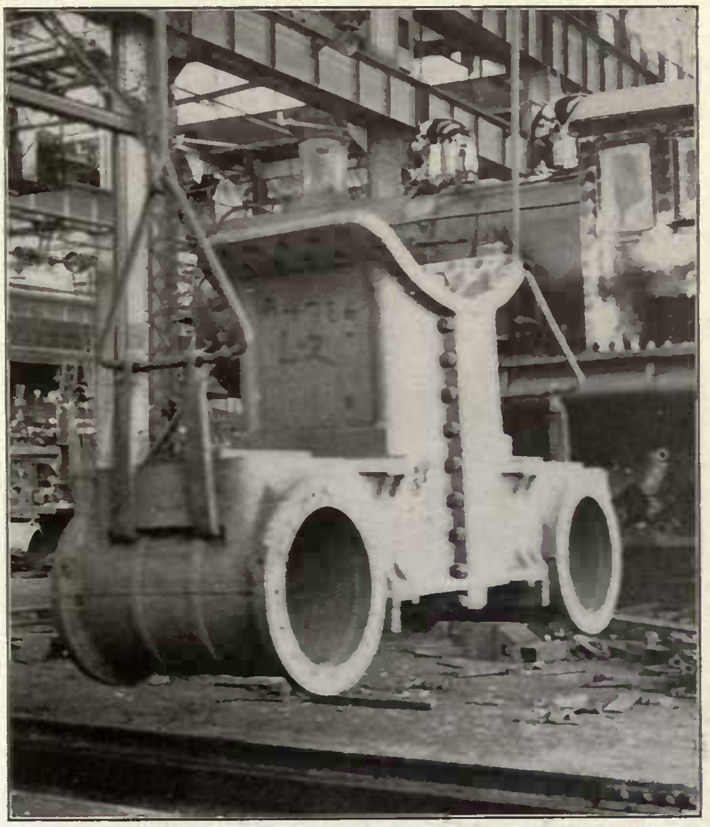


**Fig. 262—Transporting Cylinders by a Traveling Crane.**

the use of the hooks. There is a heavy crossarm above to which the crane block is attached. Cylinders are easily handled to and from the frames with this device. —*Lehigh Valley, Sayre, Pa.*

DRIVER BRAKE RIGGING, RACK FOR.

An inexpensive rack, which keeps the driver brake rigging off the floor and economizes floor space, is

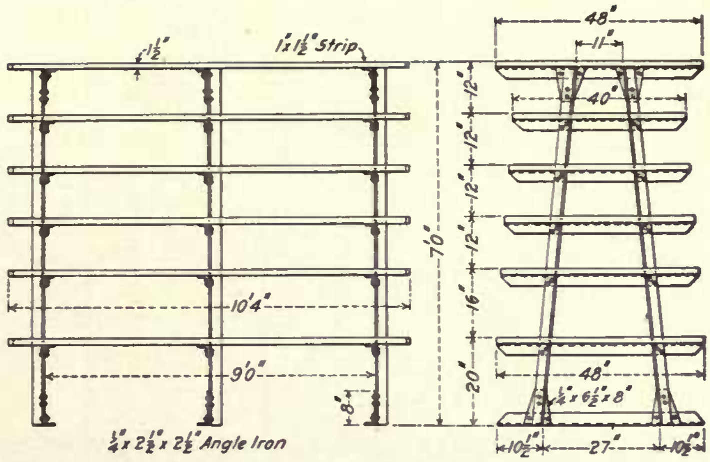




**Fig. 263—Rack for Driver Brake Rigging.**

shown in Fig. 263. The frame is constructed of 2½ x 2½ x ¼-in. angle iron.—*Rock Island Lines, Silvis, Ill.*

DRIVING AXLE, KEY-WAY MILLER.

The tool shown in Fig. 264 is designed to greatly facilitate the cutting of key seats in driving axles. The standard Morse taper shank is provided for attaching an air motor directly above the milling cutter. Steel ball races and bearings prevent any loss of power due to friction. The tool is fastened to the axle by means of two chains and tightening screws, which latter bear against the underside of the axle. The V-shaped surface of the device provides for bringing the cutter on the center line of the axle. The depth of the key-way is governed by the horizontal star wheels and is maintained by setting the lock nut. The feed is governed by the screw at the opposite end of the device. Provision is made for taking up all possible wear in the guides,

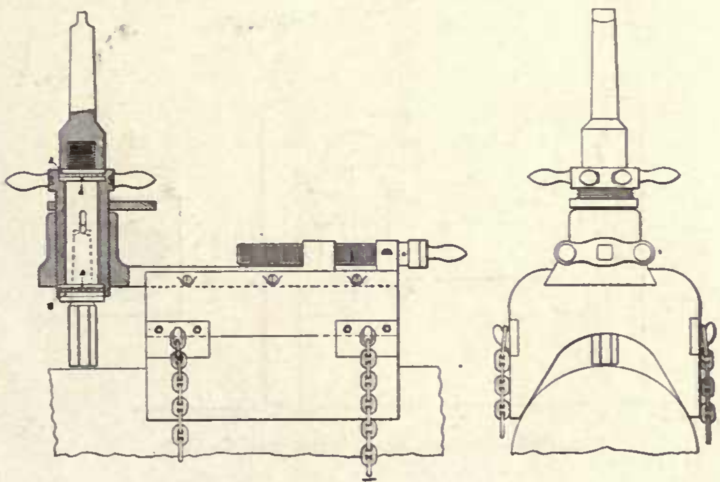


**Fig. 264—Portable Key Seat Miller.**

there being two adjustable gibs which are adjusted by the set-screws shown in the side elevation—*Erie Railroad, Meadville, Pa.*

DRIVING AXLES, TOOL FOR SCRIBING CIRCLE ON END OF.

There is an advantage in having the circles, which are scribed on the ends of driving axles, from which the prick punch marks are made when tramming the wheels for the side rods, of a standard size. These circles are usually cut in new axles on the lathe, but they become partly obliterated after the axle has been in service for

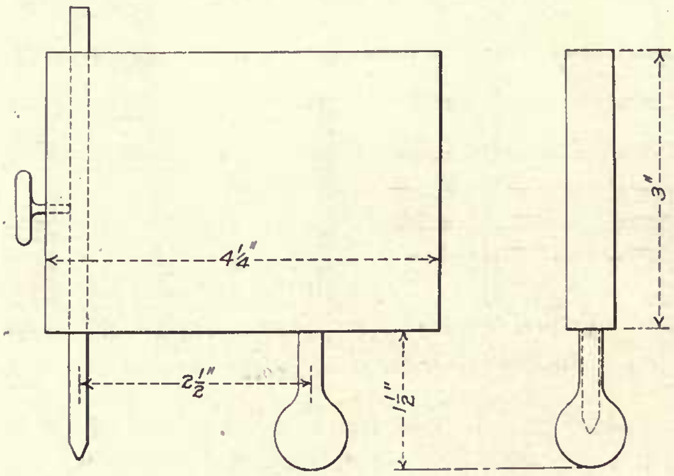



**Fig. 265—Tool for Scribing Circles on Driving Axles.**

some time. The tool illustrated, Fig. 265, is used for truing up an old circle or for making one on an axle that has not been so marked. The body of the tool is made of wrought iron and the ball center and the scriber are of steel. The ball is placed in the large center in the axle and the tool is used as a pair of dividers.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

DRIVING BOX CELLARS, REMOVING.

A method of removing tight-fitting driving-box cellars without damaging them, as is the case when using a sledge hammer, is shown in Fig. 266. The boxes are

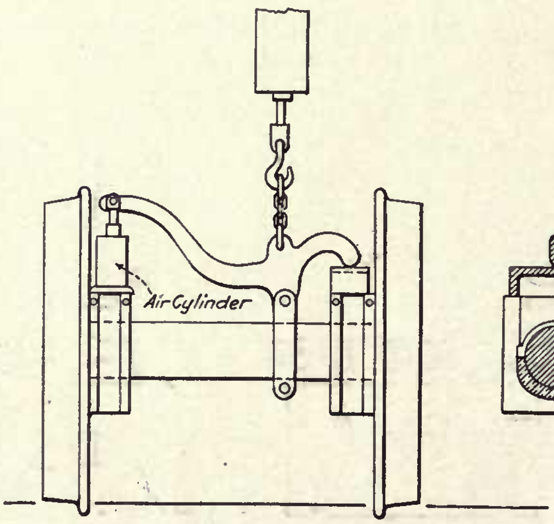



**Fig. 266—Removing Driving-Box Cellars.**

first rolled over on the axles. The apparatus is swung above the axle from a traveling air hoist and the fulcrum of the lever, made in the form of a double clamp and bolted at the bottom, is fastened to the axle. The U-shaped piece of metal is then placed in position, bearing against the box only, after which the cellar bolts are removed. The other box is used for a foundation for the air cylinder. When the air is applied the box is forced down and off of the cellar, which latter is used as the cylinder foundation when removing the opposite box.—*James Stevenson, Foreman, Pennsylvania Railroad, Olean, N. Y.*

DRIVING BOX TRUCK.

A truck that has been very helpful in moving driving boxes from place to place about the shops, while being handled by the different departments, is illustrated in Fig. 267. Anyone who has tried to handle a driving box on the ordinary shop truck knows what a hard job it is,

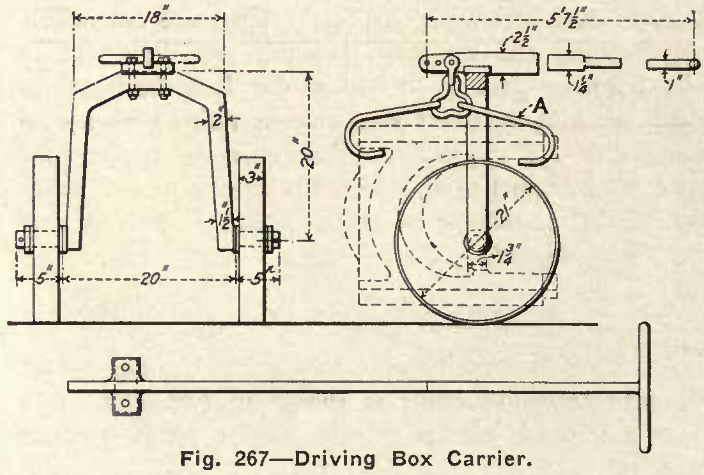



**Fig. 267—Driving Box Carrier.**

and will appreciate the use of a carrier of this kind. It has another advantage, in that it can always be found, for it cannot be used for any other kind of trucking.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

DRY PIPE JOINT IN TUBE SHEET.

A special rigging for grinding the dry pipe into the front tube sheet is shown in Fig. 268. The device con-

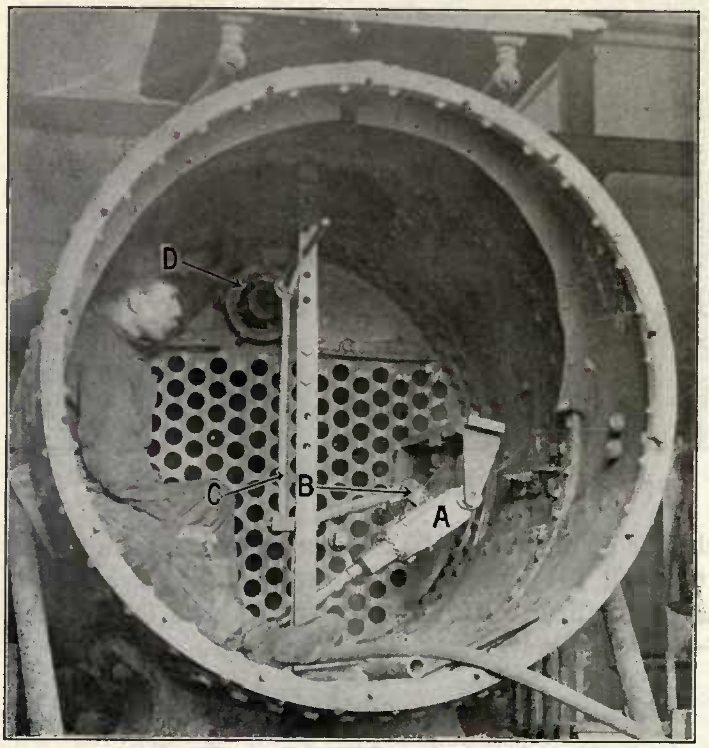



**Fig. 268—Grinding Dry Pipe Joint in Tube Sheet.**

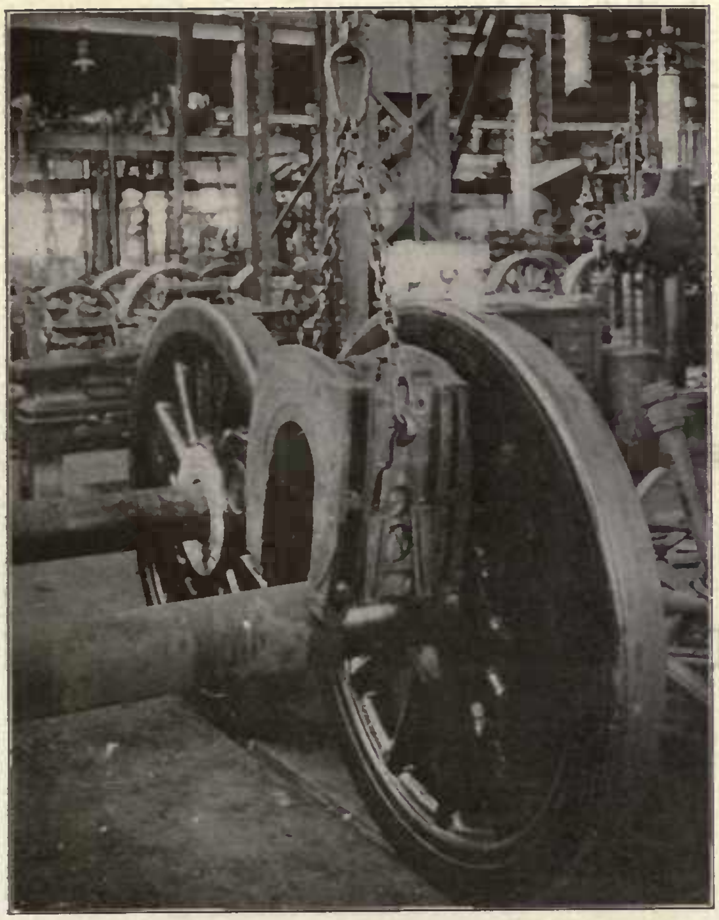


Fig. 269—Expanding Wedge Device Used for Handling Driving Boxes.

sists of an air motor *A* connected to a crank *B*, which oscillates the handle *C* attached to the dry pipe *D*, as shown in the photograph.—*Chicago & North Western, Chicago.*

DRIVING BOXES, HANDLING.

An ingenious device, consisting of a pair of expanding wedges, is used for grasping the driving boxes while handling them with a crane. One of these is shown in use in the photograph, Fig. 269, and in detail in the drawing, Fig. 270. There are two loose shoes, which slide on the edges of the wedge-shaped centerpiece, guided by two pins and the slots shown. The weight of the box serves to bind the shoes against the flanges.—*Lehigh Valley, Sayre, Pa.*

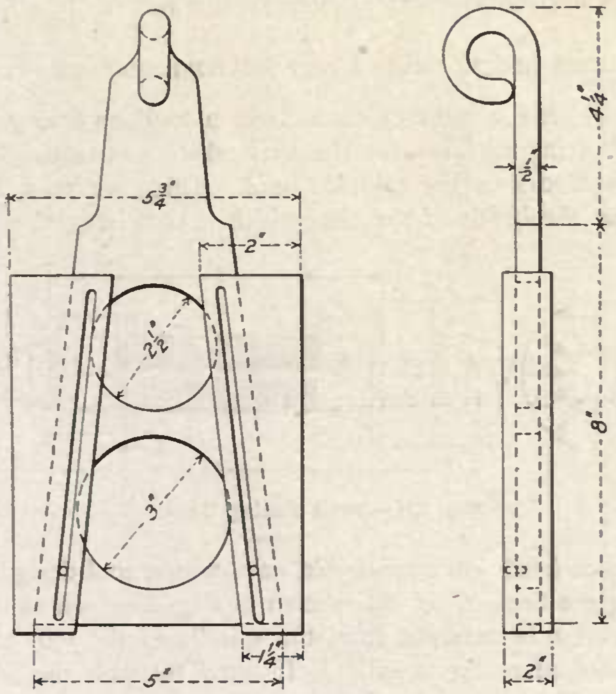



Fig. 270—Expanding Wedge Used in Handling Driving Boxes.

ECCENTRIC BLADE BENDER.

A simple eccentric blade bender, Fig. 271, can be made at a cost of $2.25. Instead of employing the old method of twisting and bending with heavy apparatus and using heavy wrenches, this simple kink can be operated with a 12-in. wrench. Special attention is called to the short bends possible and the close places in which the bender can be operated. The slip yoke is moved along the blade so that an adjustment can be quickly made for a bend at any point. It is a cheap and handy kink for use on eccentric blades, reach rods, lifting arms, etc.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.*

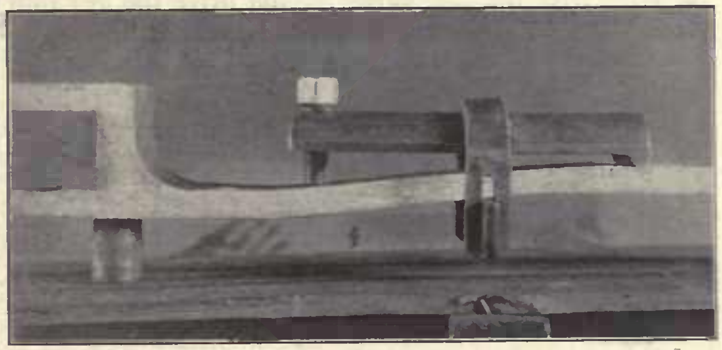


Fig. 271—Eccentric Blade Bender.

ECCENTRIC BLADE BENDER.

It is often necessary to adjust eccentric blades after they have been bolted to the eccentric strap. The device for bending the blades shown in Fig. 272 is light and may be easily applied to either side of the blade. A number of shims to suit the different blades should be carried in stock. After the device has been adjusted by

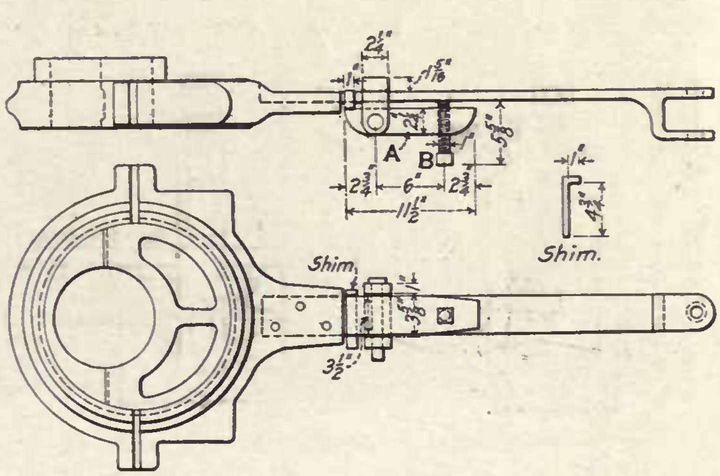



Fig. 272—Device for Bending Eccentric Blades.

putting the 1-in. pin through the strap and the bar *A*, the blade may easily be bent to any position by turning the screw *B*.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic, and Henry Holder, General Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

### ECCENTRIC BLADE BENDER.

A device for bending or straightening eccentric blades, brake levers, etc., is shown in Fig. 273. It can be used without taking these members down, and does not require the use of heavy or unwieldly bars such as are so often used for this work. It is only necessary to slip the strap over the bar, adjust it, and drive the key into place. The 1⅛-in. screw can then be turned by the use

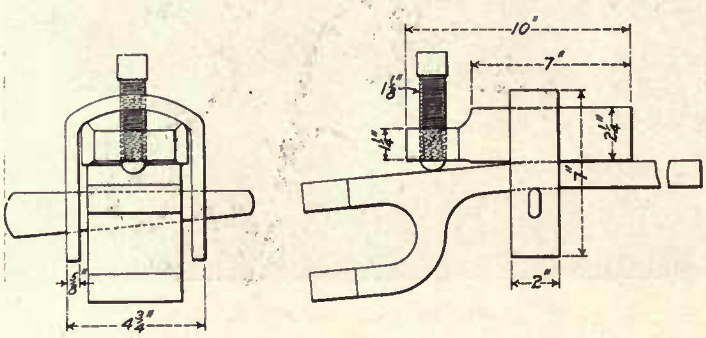


**Fig. 273—Device for Bending Eccentric Blades, Brake Levers, Etc.**

of an ordinary wrench. The key can be backed off slightly and the strap slipped along the blade or lever, if more than one operation is required to properly bend or straighten it. With this arrangement it is possible to make short bends and to operate in restricted spaces.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

### ECCENTRIC BLADE BENDER.

A light and effective eccentric blade bender is shown in Fig. 274. It is capable of bending a plate 1¼ in. thick and 4 in. wide and is easily adjusted for bending in either direction, it being only necessary to reverse

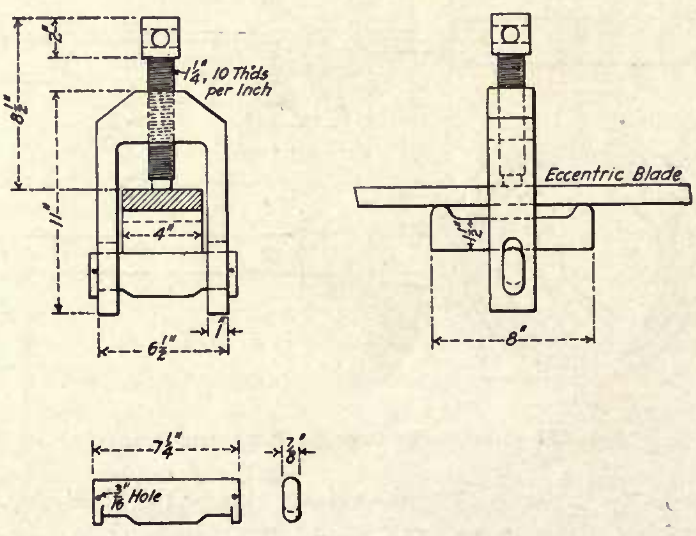



**Fig. 274—Eccentric Blade Bender.**

the block. The key is detachable. A particular point of merit in this kink is in the fact that it may be used without disconnecting the eccentric blade, and in case of emergency it can be used as a blade twister by placing a chisel or piece of iron under one edge of the block.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

### EXHAUST NOZZLE, CLAMP FOR TESTING STEAM PIPES.

A clamp for exhaust nozzles, when the steam pipes are being tested, is shown in Fig. 275. The cap *A* fits in the top of the nozzle after the tip has been removed. A steam-tight joint is secured by placing a rubber gasket over the top of the nozzle. The clamps *B* are moved in-

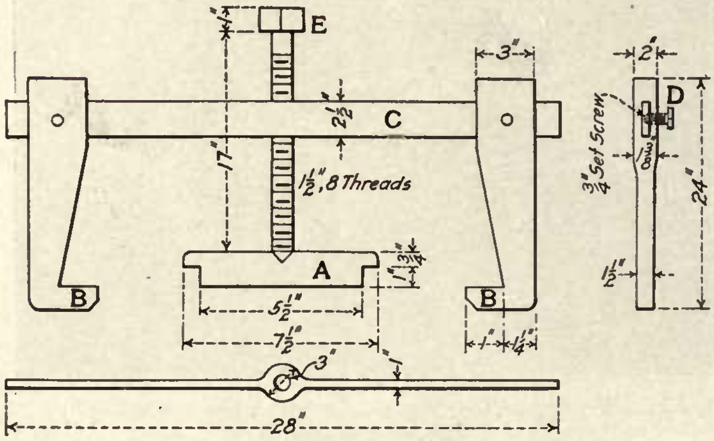



**Fig. 275—Clamp for Exhaust Nozzle When Testing Steam Pipes.**

ward along the bar *C* and fit under the edges of the flange of the nozzle casting. When these have been properly adjusted they are secured by the ¾-in. set-screws, and the cap *A* is forced securely over the top of the nozzle by turning the screw *E*.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### GUIDE BLOCK, TRUING NUT BEARING SURFACE OF.

It is often advantageous to have a tool for truing up the bearing surfaces for the nuts which secure two-bar guide blocks on the cylinder head. These surfaces, being on the inside of the disc, which is cast integral with

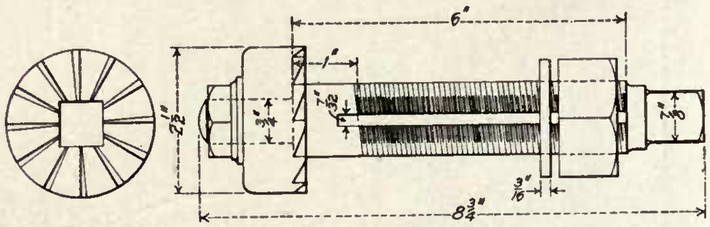


**Fig. 276—Back Facing Tool.**

the back head, are inaccessible, save with a tool designed along the lines of the one shown in Fig. 276. In using, the cutter is removed from the spindle of the tool and replaced after the spindle is inserted through the bolt hole. The nut and washer shown are then screwed against the face of the disc on the head; the feed of the cutter is regulated by this nut. A single cutter tool is often used for this work, but not so successfully as the cutter shown.—*Fred Bentz, Tool Room Foreman, Southern Pacific, Bakersfield, Cal.*

GUIDE BOLT HOLES, REAMING.

A convenient apparatus for reaming guide bolt holes is shown in Fig. 277. The rigging may be quickly set up and is operated as follows: The reamer *A* is inserted in the guide bolt hole and the lever *C*, with a fulcrum at *D* in the adjustable jack *E*, is placed under the motor. Pressure is applied by the workman at the left, thus feeding the reamer into the hole as the workman on the right operates the motor.—*Chicago & North Western, Chicago.*

Fig. 277—Reaming Guide Bolt Holes.

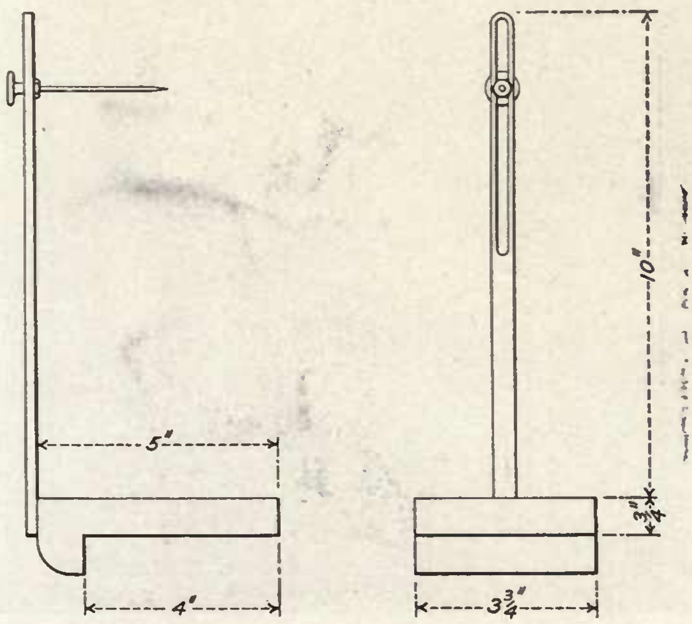


Fig. 278—Gage for Lining Two-Bar Guides.

GUIDES, GAGE FOR LINING TWO-BAR.

The lower bar of two-bar guides is usually lined up with the aid of inside calipers. It is necessary, in this instance, however, to use a square or straight-edge in truing the guide bar in the lateral direction, and a mechanic's calipers are often disturbed by being knocked on the floor by other men who may be working about the locomotive. The gage here shown, Fig. 278, was made especially for lining the lower bar. It is of brass, is light, easily handled and easily made. The upright may be fastened to the base in any convenient way. The pointer is arranged for adjustment in two directions by sliding in the slot of the upright and moving horizontally through the thumb-screw and lock nut shown. The height of the pointer is set at ¾-in. less than half the distance between the crosshead bearing surfaces, this ¾-in. being the thickness of the base. The shoulder guides the gage along the bar and the pointer is set out to the line through the center of the cylinder.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

GUIDES, LINING.

A kink used in lining up guides is shown in Fig. 279. It is constructed with the arms *A* notched at the ends to fit cylinders whose diameters range from 16 in. to 21 in. It is placed at the front of the cylinder, as shown, with a similar but smaller device in the back cylinder head supporting the bar *B*. The bar is thus held in the center of the cylinder and is free to slide backward and

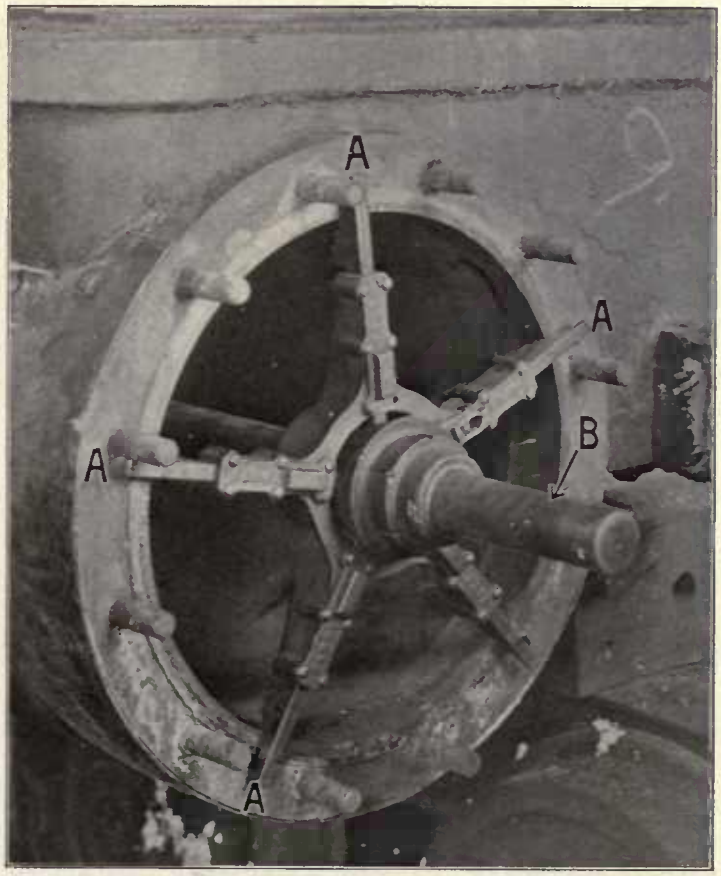


Fig. 279—Adjustable Device for Lining Up Guides.

forward, affording a means for lining up the guides.—*Chicago & North Western, Chicago.*

GUIDES, LINING.

For many years and in many shops it has been the practice to set the guides of a locomotive by means of

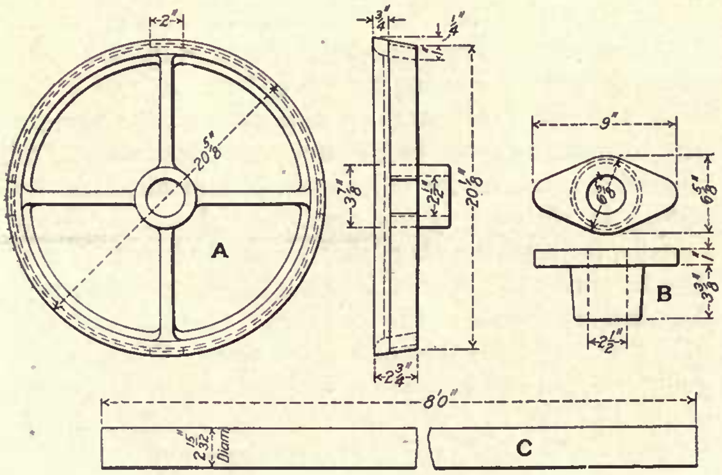



**Fig. 280—Spider and Gland for Setting Guides.**

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 the spider and gland shown in Fig. 280 are used. The spider *A* is 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 *C* is then slipped through the holes in the gland and the spider which are in line with each other. As the bar 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.—*Delaware, Lackawanna & Western, Scranton, Pa.*

LYE VAT.

The easiest and quickest method of cleaning the brake rigging, eccentric straps, link motion, driving boxes, shoes and wedges, binders, etc., is to put them in a cage which may be lowered into a lye vat, such as is shown in Fig. 281. As the Lehigh Valley shops have two erect-

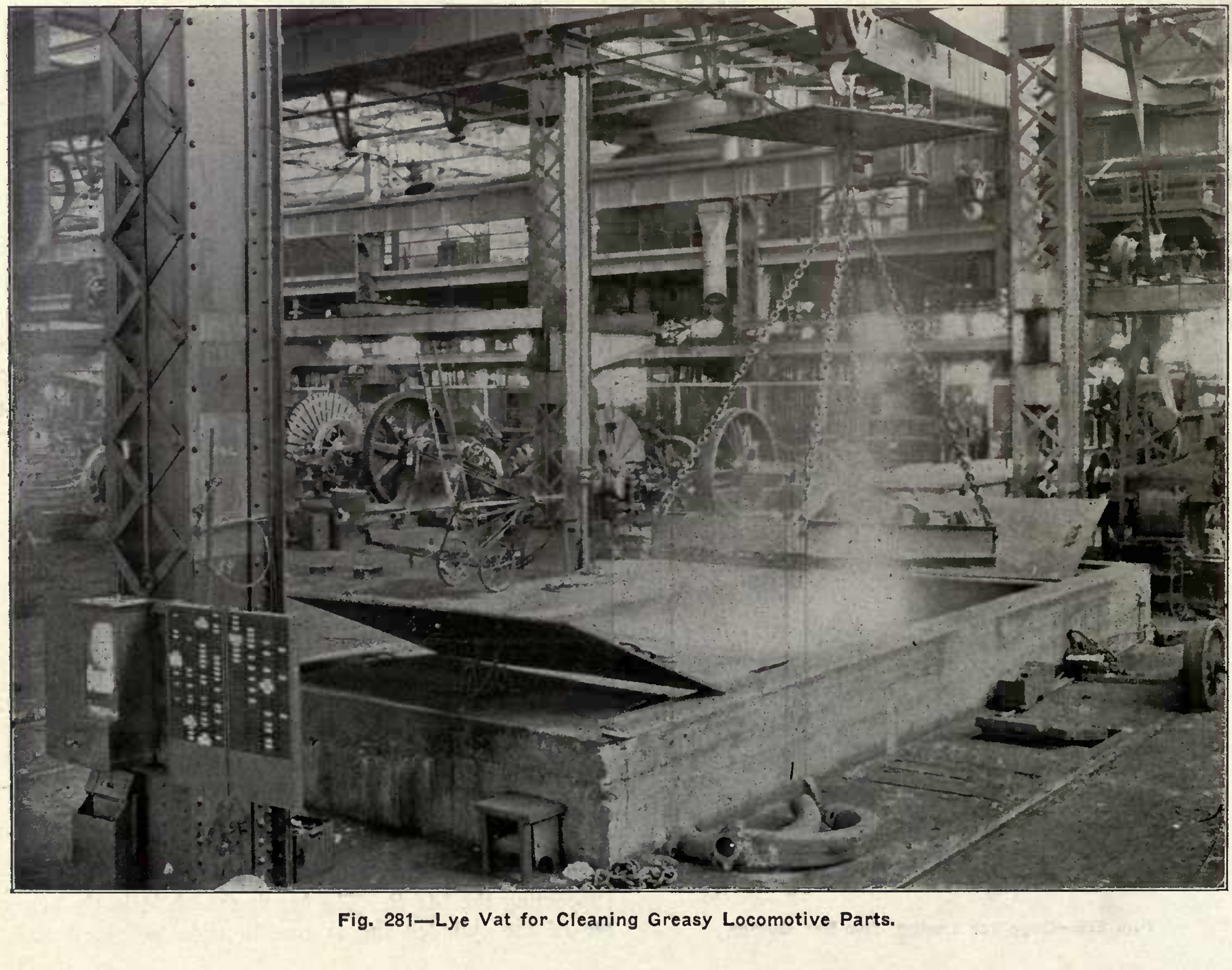


**Fig. 281—Lye Vat for Cleaning Greasy Locomotive Parts.**

ing floors, one on each side of the building, there are two of these lye vats. Each is 10 ft. wide, 30 ft. long and 14 ft. deep. There are several coils of pipe arranged along the walls of the vat near the bottom. Live steam is passed through these coils for heating the solution. It will be noticed that the crate held suspended above the vat is handled by the shop crane and that the cover sheet is lifted with the crate. Locomotive parts are lowered into the vats and left there for about twelve hours, when they are taken out and flushed with cold water.

One of the gang checking boards and a time clock are shown at the left side of the photograph. Each gang checks separately, so that there are several of these boards and clocks about the shop.—*Lehigh Valley, Sayre, Pa.*

KEYWAY SLOTTING TOOL.

A tool for slotting keyways, used in a hydraulic press, is shown in Fig. 282. The cutting part consists of a number of teeth of different heights, the lowest being

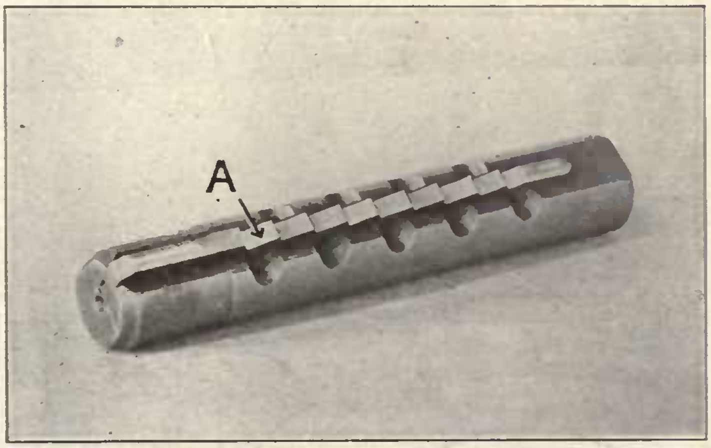



**Fig. 282—Tool for Slotting Keyways.**

at the right and the highest at the left. As the tool advances each tooth removes a little more metal than the preceding one. If necessary it may be used by driving it with a sledge.—*Chicago & North Western, Chicago.*

PEDESTAL JAW GRINDER.

A simple and successful grinder for facing off pedestal jaws over the erecting pit is shown in Fig. 283. It is motor driven, the motor being under cover on the hand truck in the foreground. The device has an angle-bracket which is held to the locomotive frame by two clamps. The grinder frame is bolted to this bracket and is adjustable sideways for grinding the vertical and sloping legs. A crosshead moves vertically in a slot in the frame, and the emery wheel is driven by bevel gearing on the rear side of the crosshead. The crosshead and wheel are moved up and down by the hand crank below the wheel, the adjacent edge of the grinder frame being toothed to form a rack. The emery wheel is an 8-in. cup type, and is swung around in a half circle back of the frame to grind the other leg. It is held in position by dowel pins. The knuckle-joint pulley-and-belt frame has arms 2 ft. 8 in. on centers and revolves around the motor shaft. The grinder can thus be swung over to a second jaw without changing the position of

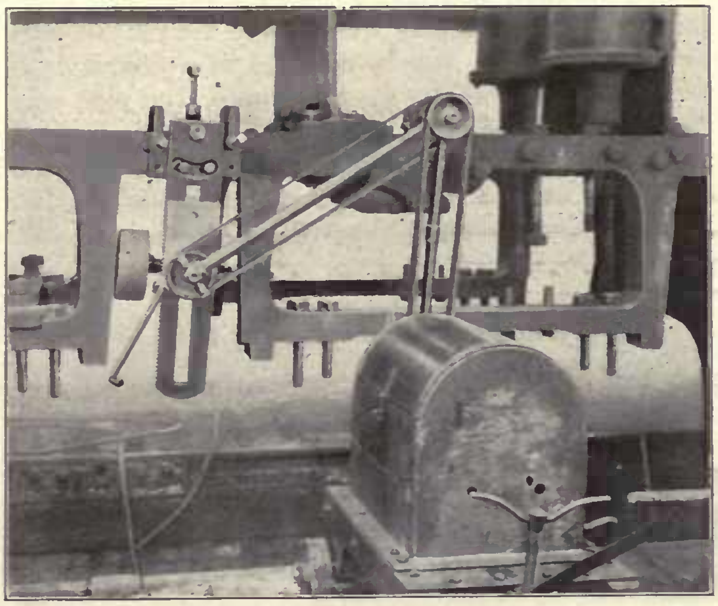


**Fig. 283—Pedestal Jaw Grinder.**

the motor. The latter operates at 900 r. p. m. and the emery wheel at 1,200 r. p. m. It is also proposed to use the devices for light truing of slide valve seats.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

PETTICOAT PIPE ADJUSTER.

A device that is convenient for properly setting the petticoat pipe and holding it in position while the hangers are being fastened is shown in Fig. 284. It may be adjusted to any size of petticoat pipe. The toggle joints

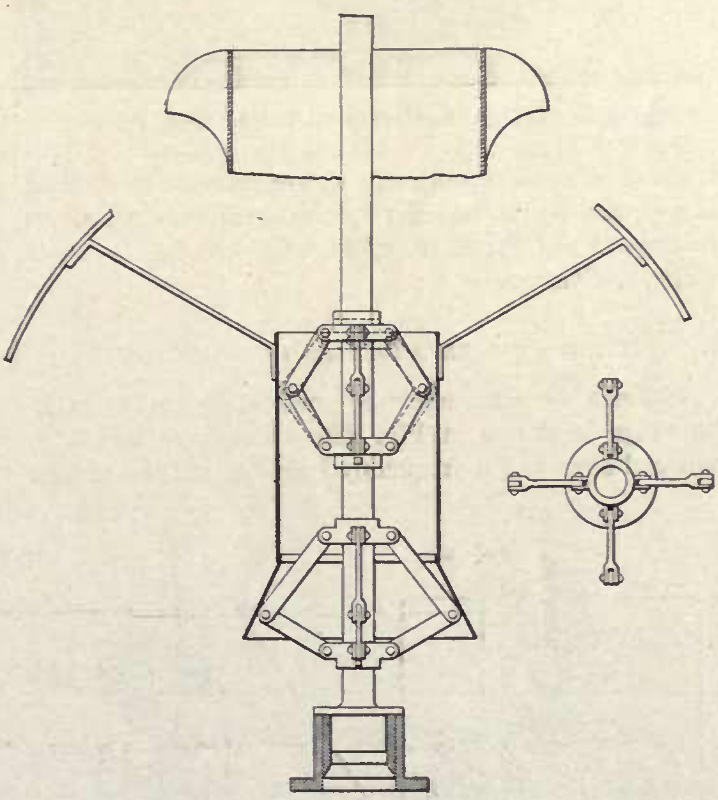


**Fig. 284—Petticoat Pipe Adjuster.**

which fit on the long bar are forced outward and fastened by the set-screws, thus holding the petticoat pipe securely in place and central with the bar. The lower end of the bar has a plug which fits in the exhaust nozzle; the upper end may be adjusted to a central position in the smoke stack by calipering. The pipe may then easily be held in position while the hangers are being fastened. This is much more convenient than the old way of using a string and a plum bob.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

### PISTON, REMOVING FOLLOWER FROM.

A tool of great advantage in removing the follower from the piston is shown in Fig. 285. The dogs *A* and

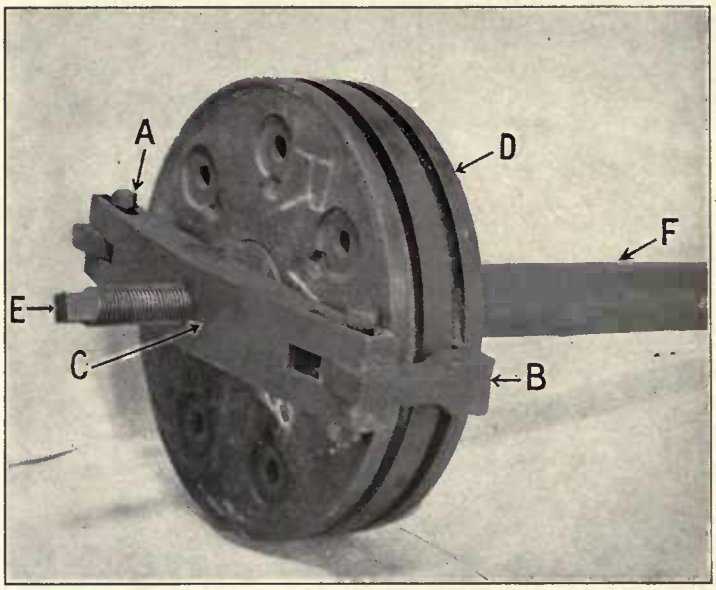



**Fig. 285—Tool for Removing Bull Ring from Piston.**

*B*, attached to the cross piece *C*, are inserted in the bull ring *D*, and the screw *E* is forced against the piston *F*; the dogs *A* and *B* pull the spider off.—*Chicago & North Western, Chicago.*

### PISTON RING EXPANDER AND CONTRACTOR.

A device for expanding or contracting piston packing rings is shown in Fig. 286. They are turned to standard sizes and it frequently happens that the nearest size ring does not quite fit the cylinder. In order to make a perfect fit the ring may be altered by the use of this device. Three hardened rollers, 3 in. in diameter, are arranged as shown. The upper roller can be adjusted vertically by a thumb-screw, and it is also keyed to a shaft with a square head, so that it can be turned with a crank. If the ring is too large it is placed in the device with the rollers in the position indicated and by adjusting and rotating the upper roller the circumference of the ring may be reduced in a manner similar to that of a boiler sheet in the rolls. Adjustment of the screw gives the proper curvature. If the ring is too small, it is placed between the rollers in the reverse position and its diameter is enlarged.—*S. S. Lightfoot, Bonus Demonstrator, Atchison, Topeka & Santa Fe, San Bernardino, Cal.*

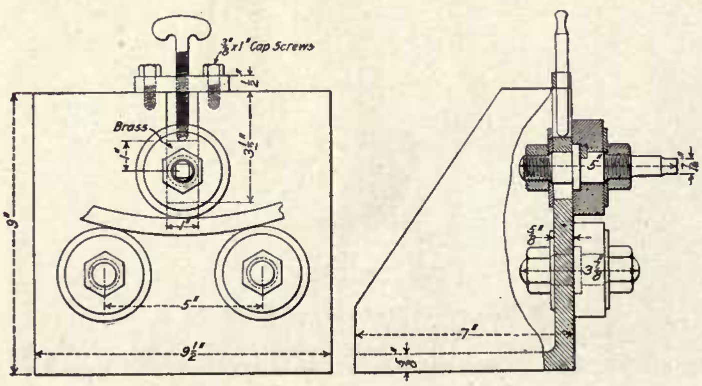



**Fig. 286—Packing Ring Expander and Contractor.**

### PISTON RING, COMPRESSING.

A handy device for compressing the packing rings on a solid piston head while applying it to the cylinder is shown in Fig. 287. Ordinary wedges, the tang of a file, etc., are often used for this work. This device is placed around the piston head and over the rings and is tightened up by the small pinion and latch, which latter acts as a ratchet to mesh in the rack and hold the band tightly. The band is made of No. 16 sheet iron, 3 in. wide. The lugs or projections at its edge prevent it from

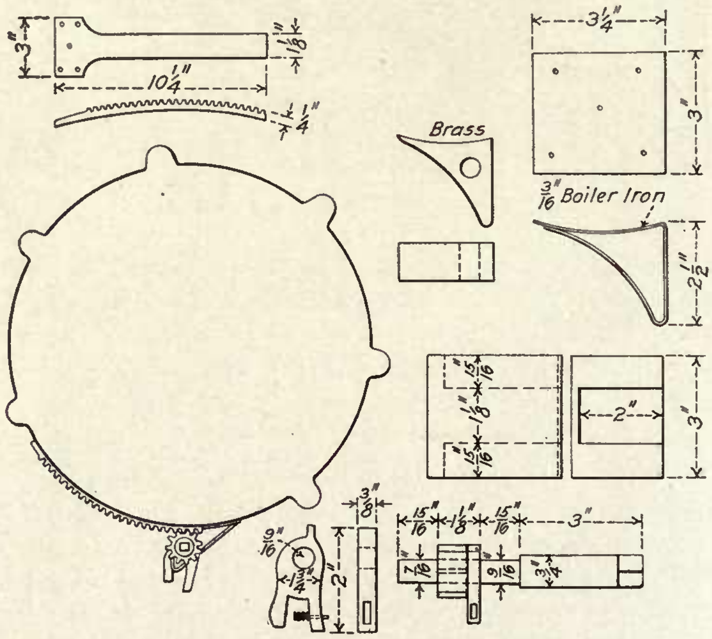



**Fig. 287—Device for Compressing Piston Packing Rings.**

slipping into the cylinder. In using, the band is tightened until the rings are flush with the piston head, and as it passes into the cylinder the band is forced off by the lugs.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

### PISTON ROD EXTRACTOR.

The accompanying illustration, Fig. 288, shows a piston rod puller which can be made complete for 80 cents, labor and material. The method of pulling is the reverse of that when the piston rod is keyed up. It is a cheap, handy and sure device.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.*

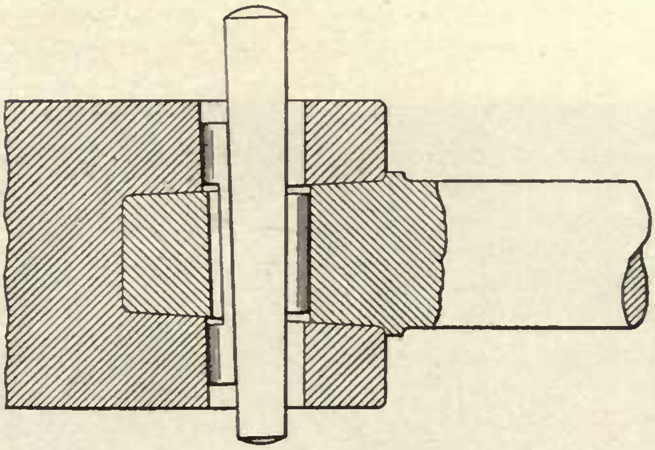


Fig. 288—Device for Pulling Piston Rods.

PISTON ROD EXTRACTOR.

The separator, Fig. 289, is made on the same principle as the bolt extractor shown in Fig. 245, and is used for separating the crosshead and piston rod. It is made of wrought iron. The ⅛-in. holes and the space behind the ram are filled with thick oil. The separator is applied to the crosshead, taking the place of the end of the connecting rod, and the wrist pin is put in place. The wrought iron ram forces the oil against the plunger, which is shown in detail at the upper part of the drawing. The center of the ram engages that of the piston rod, forcing the latter out of the crosshead. This is a very handy tool for both shops and roundhouses.—*A. D. Porter, Shop Efficiency Foreman, Canadian Pacific, West Toronto, Canada.*

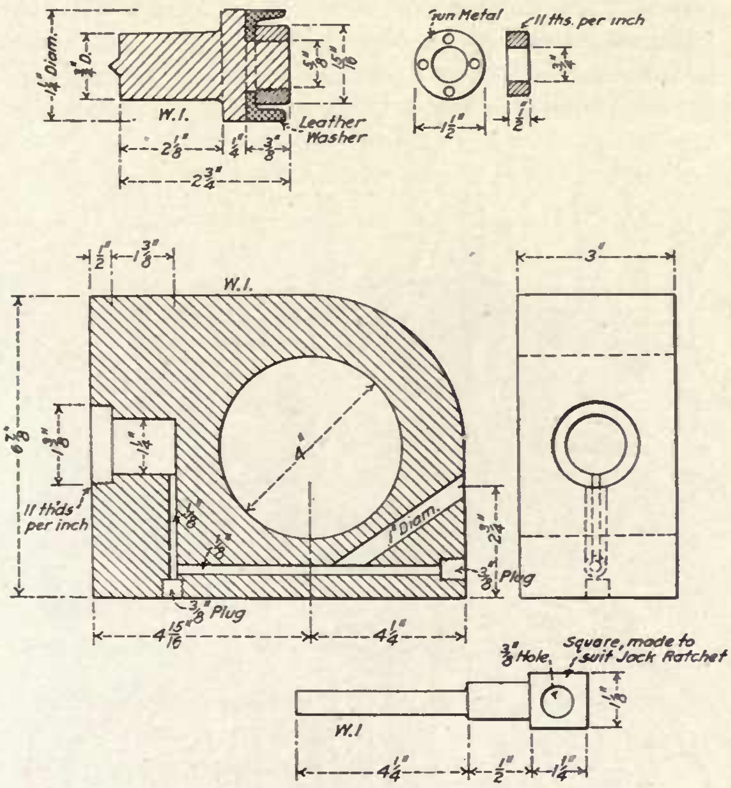



Fig. 289—Piston Rod Extractor.

PISTON ROD EXTRACTOR.

A simple but effective piston rod puller is shown in Fig. 290. The main block is made to conform to the taper of the pin fit in the crosshead, and has a tapered slot planed through it, as shown, to receive a key. The block, which bears against the end of the piston rod, has a round boss in the center on one end and a tapered tongue on the other. This tongue extends into the slot of the pin portion of the device and is tapered to correspond to the key.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

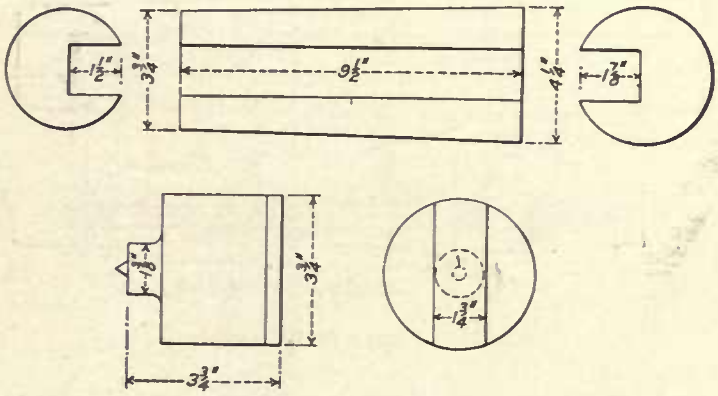


Fig. 290—Piston Rod Puller.

PISTON ROD EXTRACTOR.

A piston rod extractor of unusual strength and one which will draw piston rods without damaging the crosshead is illustrated in Fig. 291. The piston is first drawn back to its striking point. The long two-piece sleeve is applied to the rod, bearing against the packing gland. The two collars are then applied at the crosshead end of the rod. The halves of the collars are held together by bolts. Taper keys are driven in the ways between the collars to draw the piston.—*James Stevenson, Foreman, Pennsylvania Railroad, Olean, N. Y.*

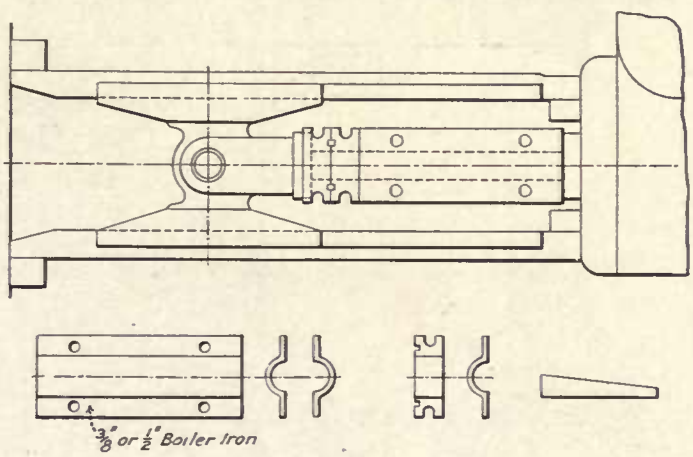



Fig. 291—Piston Rod Extractor.

### PISTON ROD EXTRACTOR.

A piston rod extractor, which was designed some years ago and has performed good service, is shown in Fig. 292. Two straps, *A, A,* are set over the piston rod and the apparatus respectively, and are held in position by the bolts *B*. The apparatus consists of a cylinder *C,* in which there is a piston, the stem *D* of which projects and is brought to a bearing against the end of the piston rod. The strap prevents the cylinder from

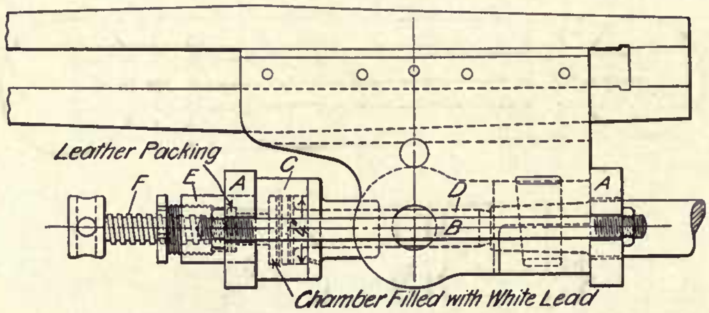



**Fig. 292—Piston Rod Extractor.**

backing off when pressure is applied. The projecting end of the cylinder at *E* is fitted with a coarsely threaded screw *F,* whose head receives a turning bar through a drilled hole. The end of the screw works through a leather packing, the space between it and the piston being filled with white lead, which acts as a pressure medium. In using, the device is adjusted so that the stem of the plunger bears against the piston rod, after which the screw is run in. This displaces the white lead, the thrust of the screw being multiplied in proportion to the square of its diameter and that of the piston.

### PISTON VALVE CHAMBER, BORING.

A simple and efficient device for boring piston valve chambers is shown in Figs. 293 and 294. It consists of heads with tapered shoulders on the inner faces to fit the

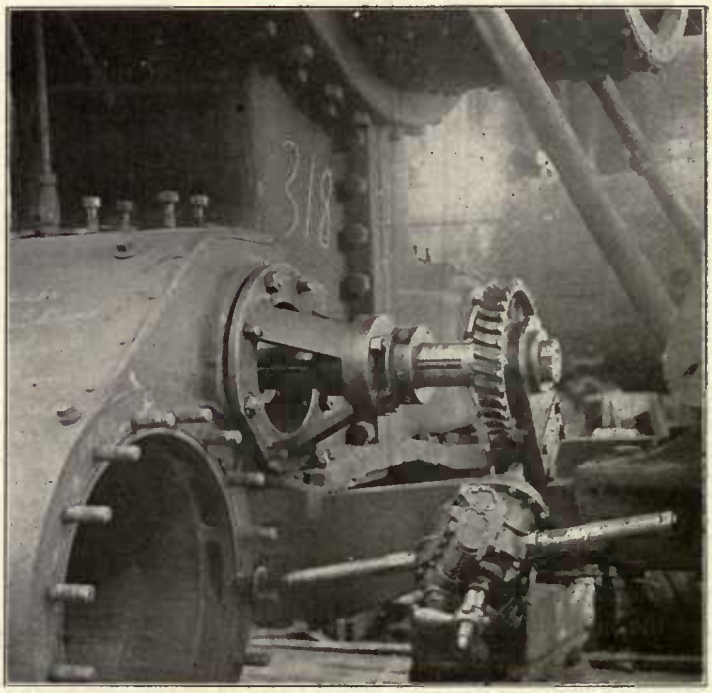


**Fig. 293—Application of Device for Boring Piston Valve Chambers.**

counterbores of the steam chest. This, together with the holes which fit over the steam chest cover studs, make it self centering. The heads are fitted with bushings at their outer ends in which the boring bar fits; collars are

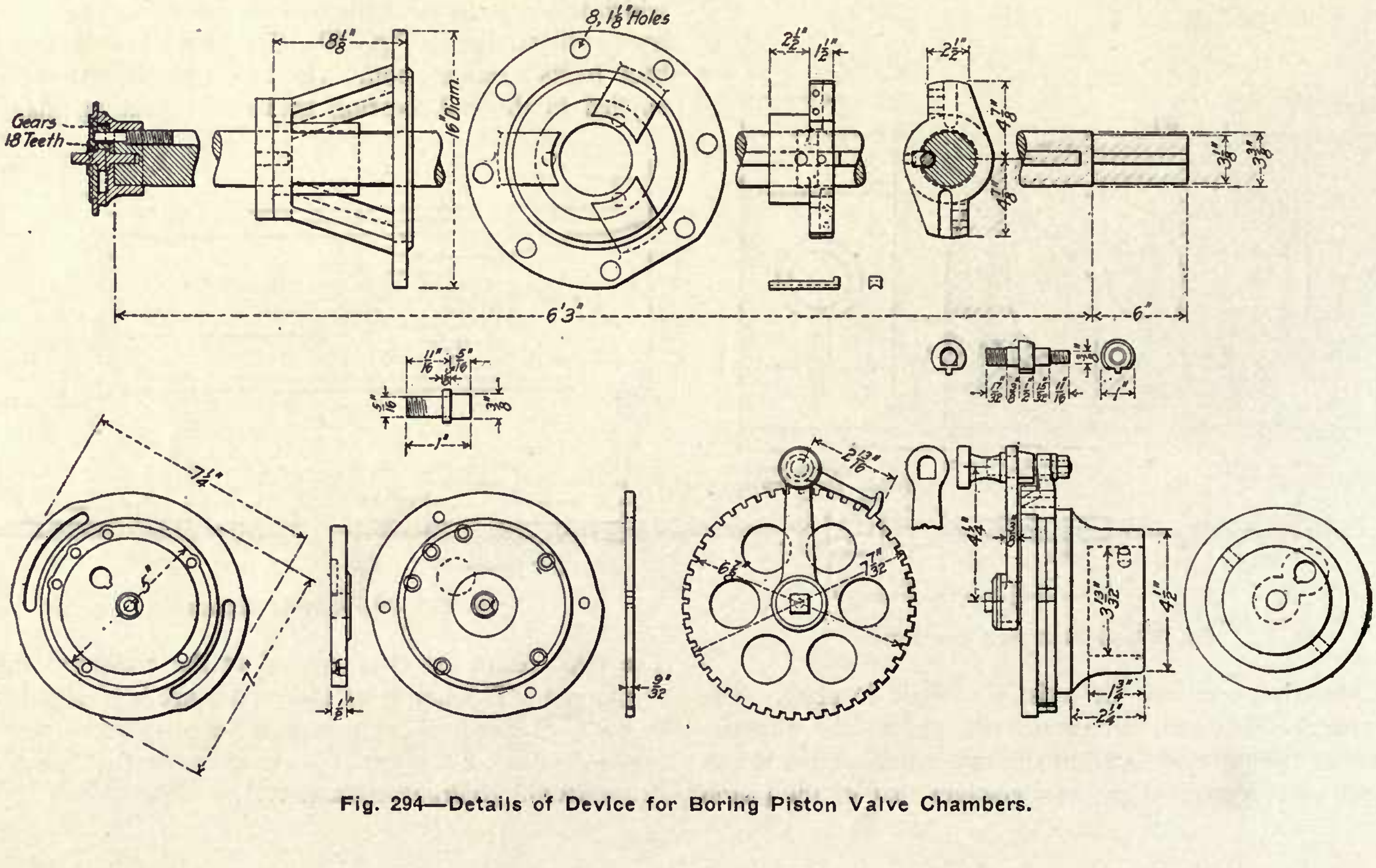



**Fig. 294—Details of Device for Boring Piston Valve Chambers.**

so placed as to prevent the boring bar from moving endways. At the front end of the bar and clearly shown in the photograph is a worm gear which meshes with a worm. An air motor fits on the taper shank on this worm. The feed mechanism is placed at the other end of the boring bar and may be regulated to give either a fine or a coarse feed. Different heads are provided for the different size valve chambers.—*P. F. Smith, Chief Draftsman; Thos. Marshall, Master Mechanic; Henry Holder, General Foreman, and James Findlay, Machine Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

PISTON VALVE KINKS.

The parallel strip, shown in Fig. 295, is used to considerable advantage in lining up dowel pins on piston

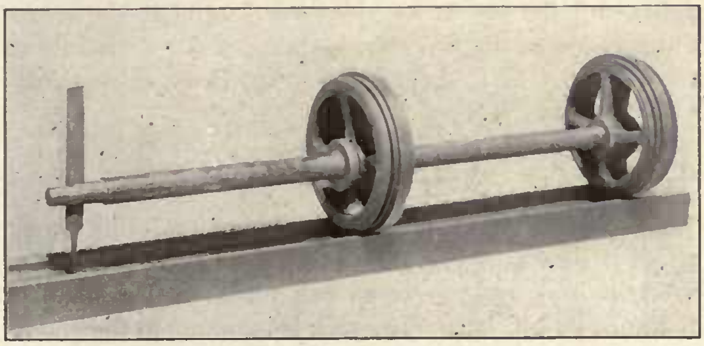


**Fig. 295—Parallel Strip for Lining Up Dowel Pins on Piston Valve Spiders.**

valve spiders. For the proper laying off of keyways on piston valve spiders the device shown in Fig. 296 is used. The spider *A* is placed in the countersunk hole in the plate *B*, and the parallel strip *C* is inserted in the slots of the tool posts *D* and *E*, as shown. The keyway is then scribed at *F*. It is thus located in the correct position

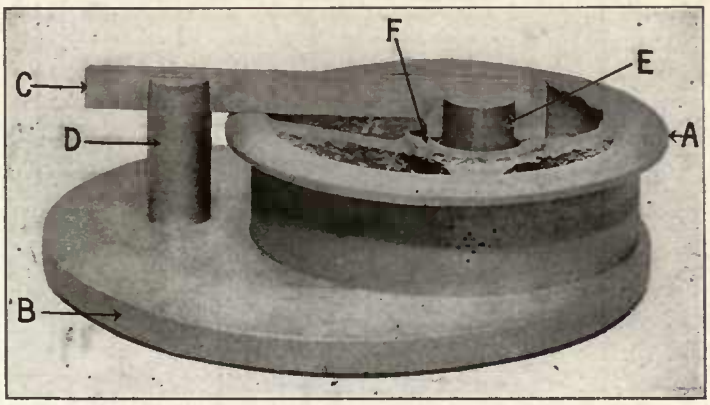



**Fig. 296—Laying Off Keyways on Piston Valve Spiders.**

and there is no danger of the valve binding in the steam chamber when it is connected to the valve motion.—*Chicago & North Western, Chicago.*

PRESS, HYDRAULIC.

The hydraulic press for rod bushings shown in Fig. 297 has a table which stands on four substantial legs that are embedded in a concrete base and extend up to and through the upper plate, which is held in position by the 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 plunger. The lower end of the plunger sets in a hole in a plate or crosshead, to the ends of which lifting chains are attached as shown. These chains pass over sheaves set on the uprights at the top

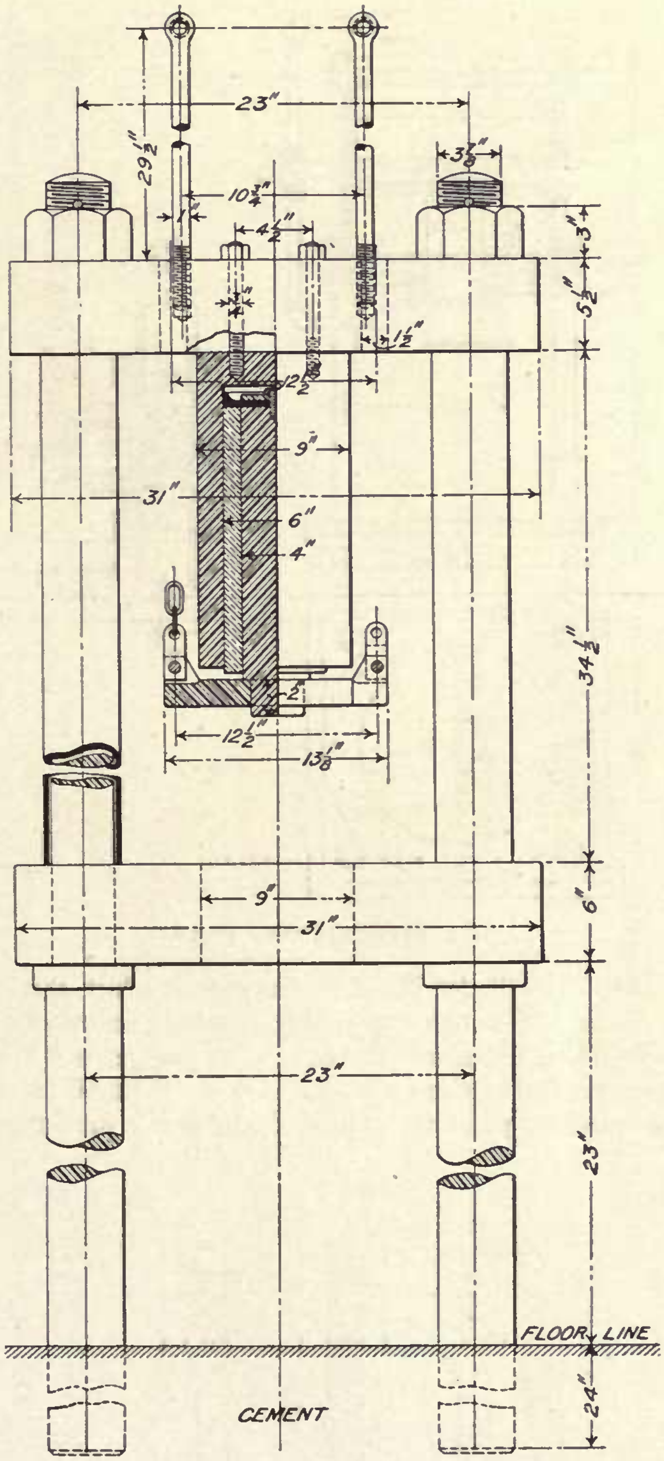



**Fig. 297—Hydraulic Press for Rod Bushings.**

and carry counter-weights at their ends which serve to draw the plunger up after it has done its work and the pressure has been removed. The plunger is 6 in. in diameter inside and 9 in. in diameter outside. Pipe spacers are used over the uprights for holding the base and top plates the proper distance apart.—*Delaware, Lackawanna & Western, Scranton, Pa.*

PRESS FOR DRIVING BOX BRASSES, ETC.

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. A press of this kind is shown in Fig. 298. It has

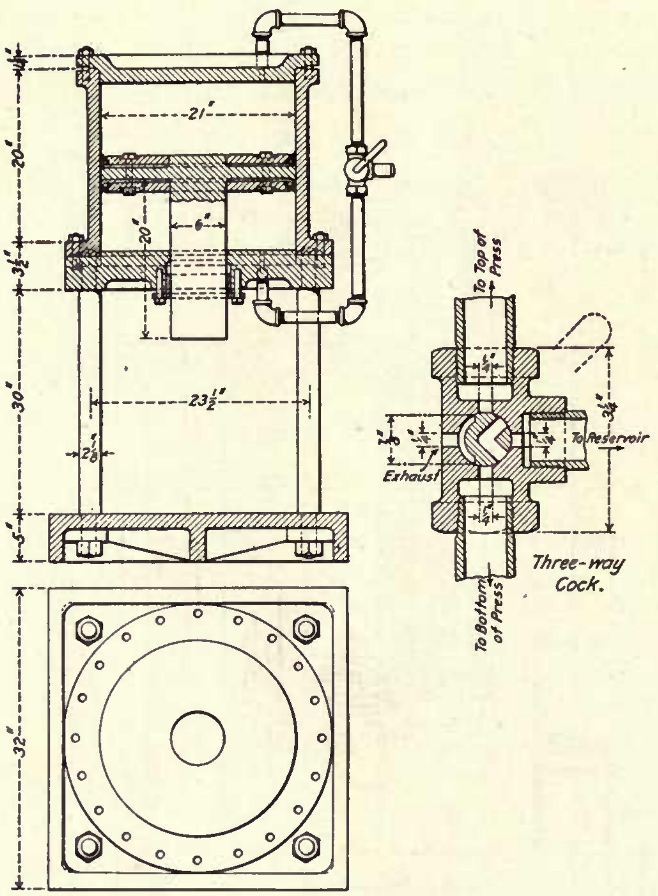


Fig. 298—Pneumatic Press.

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. 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, which is shown in detail, can be made to exhaust from one end of the cylinder while admitting air to the other, or can blank all ports.—*Delaware, Lackawanna & Western, Scranton, Pa.*

PRESS, PORTABLE.

The portable straightening press, which is shown in Fig. 299, is used largely for straightening main and side rods and in applying or removing bushings from them. The base of the truck is an iron casting and is mounted on 10⅛-in. wheels with 3-in. treads so that it may easily be moved from one part of the shop to another. The uprights and the top cross piece are forgings; the screw, which is 3¼ in. in diameter, is threaded for a distance of about 20 in.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

PRESS FOR LIGHT WORK.

The 30-ton press for rod bushings and link work, which is shown in Fig. 300, consists of a frame work of wrought iron, resting on an oak plank, and a standard hydraulic 30-ton jack. The jack is mounted in the framework as shown, the top fitting in the top crosspiece. The yoke or crosspiece on which the jack rests is supported by the springs at either side. As the jack is operated it is forced downward and the springs are compressed.

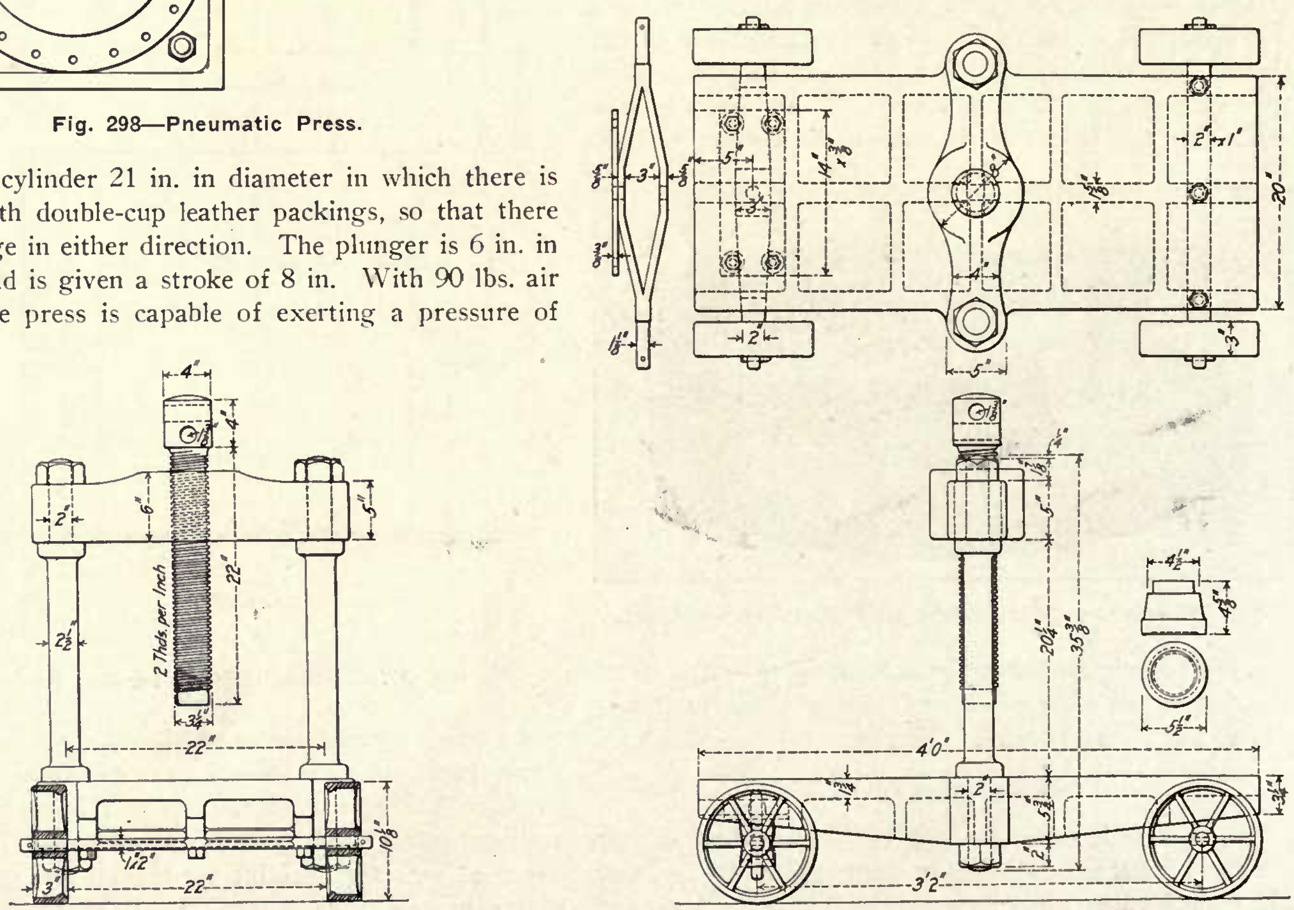


Fig. 299—Straightening Press for Rod Work.

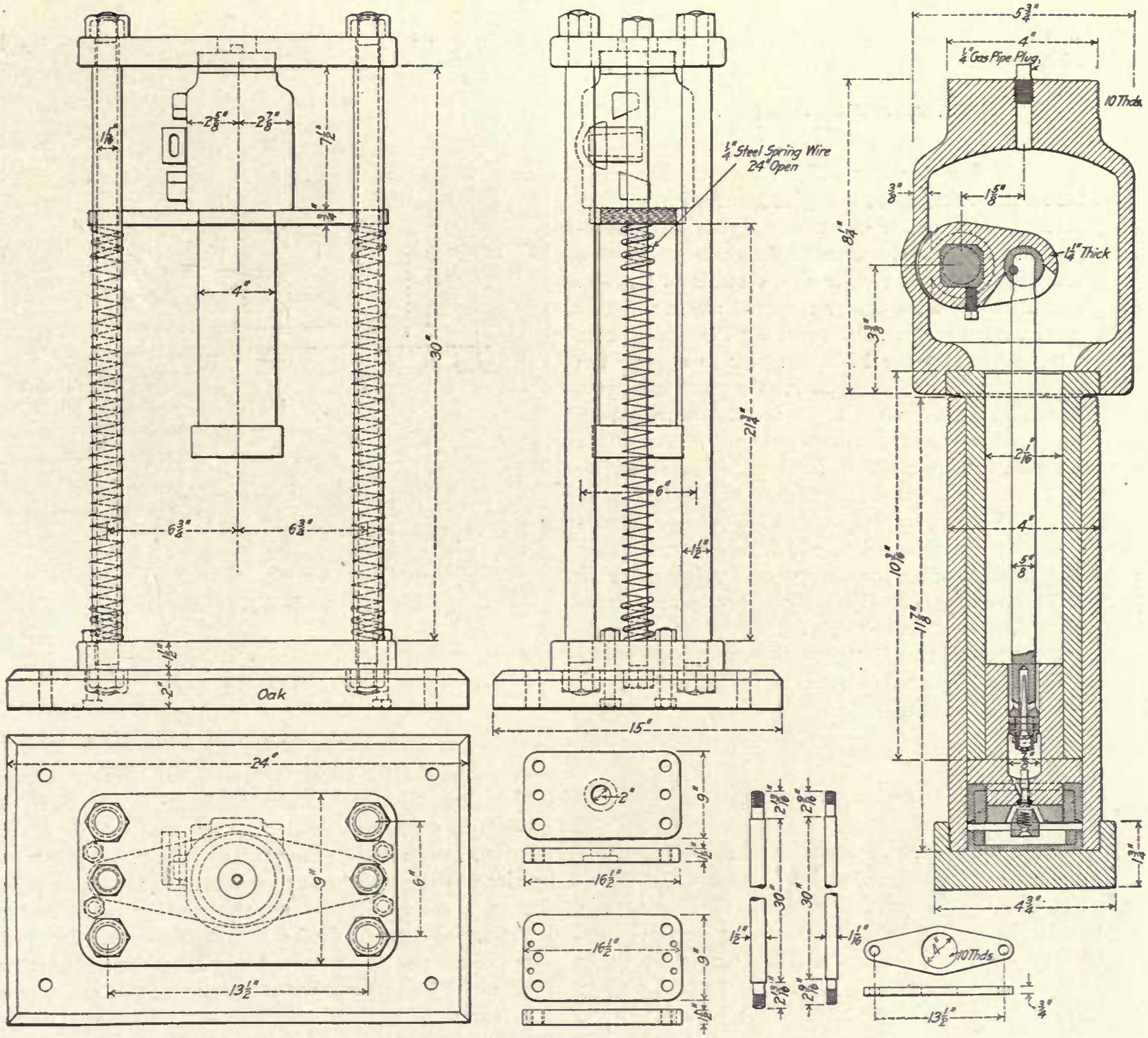



Fig. 300—Press for Light Work.

When the pressure is released the springs return the jack to its normal position, as shown on the drawing. The frame work is simple and inexpensive, and may be constructed to suit any special requirements. The capacity of the press may of course be made greater by selecting a jack of a capacity suitable to the class of work which is to be done. If it is desired to make the press portable, it may be mounted on a small four-wheel truck. It may be used to equal advantage in either the erecting shop or the engine house.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

PRESS, HYDRAULIC.

A hydraulic press for driving box brasses and rod bushings is shown in Fig. 301. Hydraulic pressure is supplied to the 8 in. cylinder on the press by replacing the air end of an air pump with a small cylinder which is supplied with water from the water line, the necessary automatic check valves being provided for the proper

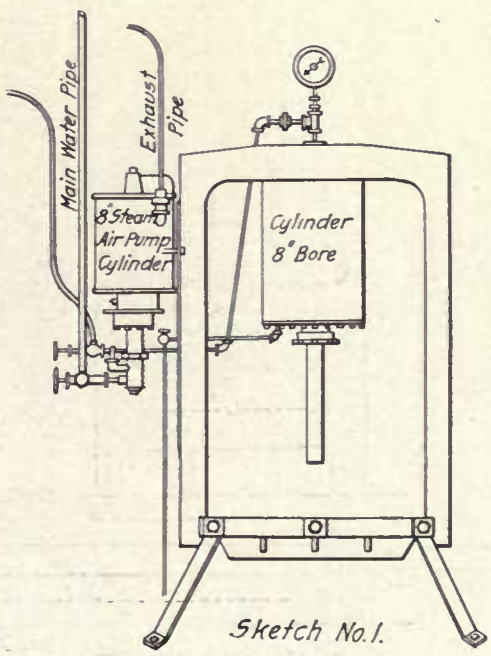



Fig. 301—Hydraulic Press.

operation of the device.—*A. L. Bauer, Foreman Machine Shop, Terminal Railroad Assn. of St. Louis.*

PRESS, PORTABLE HYDRAULIC.

A hydraulic press for applying and removing driving box brasses is shown in Fig. 302. This press is used in both the machine shop and the engine house with satisfactory results. The entire outfit is mounted on a four-wheel truck. The pump, operated by air pressure from a hose connection to the shop air line, consists of an 8-in. air pump with the air cylinder removed and a piece of pipe fitted with a piston substituted for it. This piston forces the water into the 14-in. cylinder to operate the pressure piston. Water is supplied to the pump and press from a tank located on the truck and is controlled by four check valves and two cut-out cocks. After the water is used it is returned to the tank. The side view shows a driving box brass being applied and the end view a rod brass. In applying driving box brasses, it is necessary to use the extension piece, which, however, is easily removed when handling rod brasses. The press is equipped with a gage showing the number of tons' pressure exerted. On several occasions the pressure was run up to 40 tons without any leak or apparent damage to the press.—*E. G. Gross, Master Mechanic, Central of Georgia, Columbus, Ga.*

RATCHET, CLOSE-QUARTER.

A 3¾-in. close-quarter ratchet is shown in detail in Fig. 303. The Morse taper socket, the ratchet and the feed screw are seen to be in one piece. The tang of the drill extends through a slot into a counterbore to provide for removing the drill. The hardened center in the feed sleeve has a left-hand thread and a hexagon nut which seats on top of the sleeve. This center fits freely in the sleeve as it is necessary to remove the center when knocking out a drill. The ratchet dog is fulcrumed on a 3/16-in. pin, extending through both sides of the head, and is held in contact with the ratchet wheel by pressure

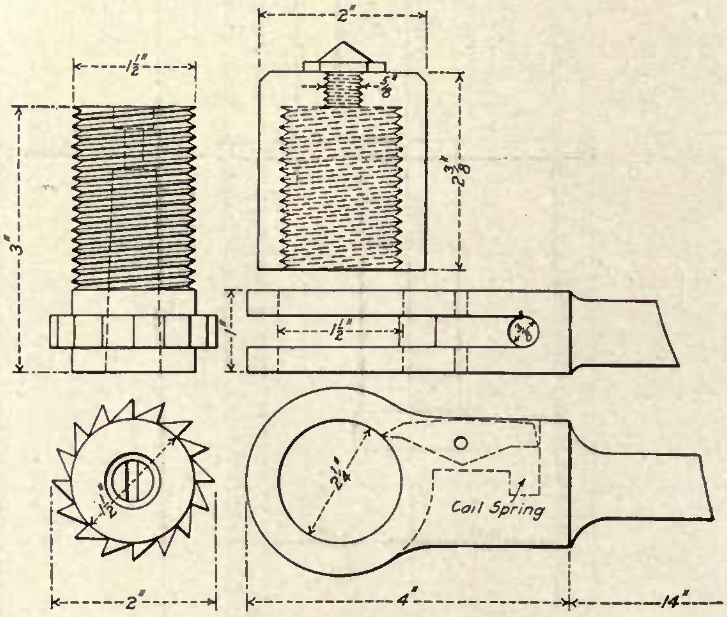



Fig. 303—Close Quarter Ratchet.

from a ⅜-in. coil spring, as indicated.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

ROCKER BOX BORING BAR.

A simple bar for boring rocker boxes without removing them from the locomotive is shown in Fig. 304. It consists of a piece of hollow tubing, with a taper shank fastened in one end to take the air motor. Brackets or bearings to support the bar are bolted to the guide yoke, and an L-shaped brace is clamped to one of the rocker boxes to support the feed screw at the end of the shaft opposite the motor. The feed may be operated either by hand or by fastening a wrench to the square end of the feed screw to hold it stationary.—*P. F. Smith, Chief*

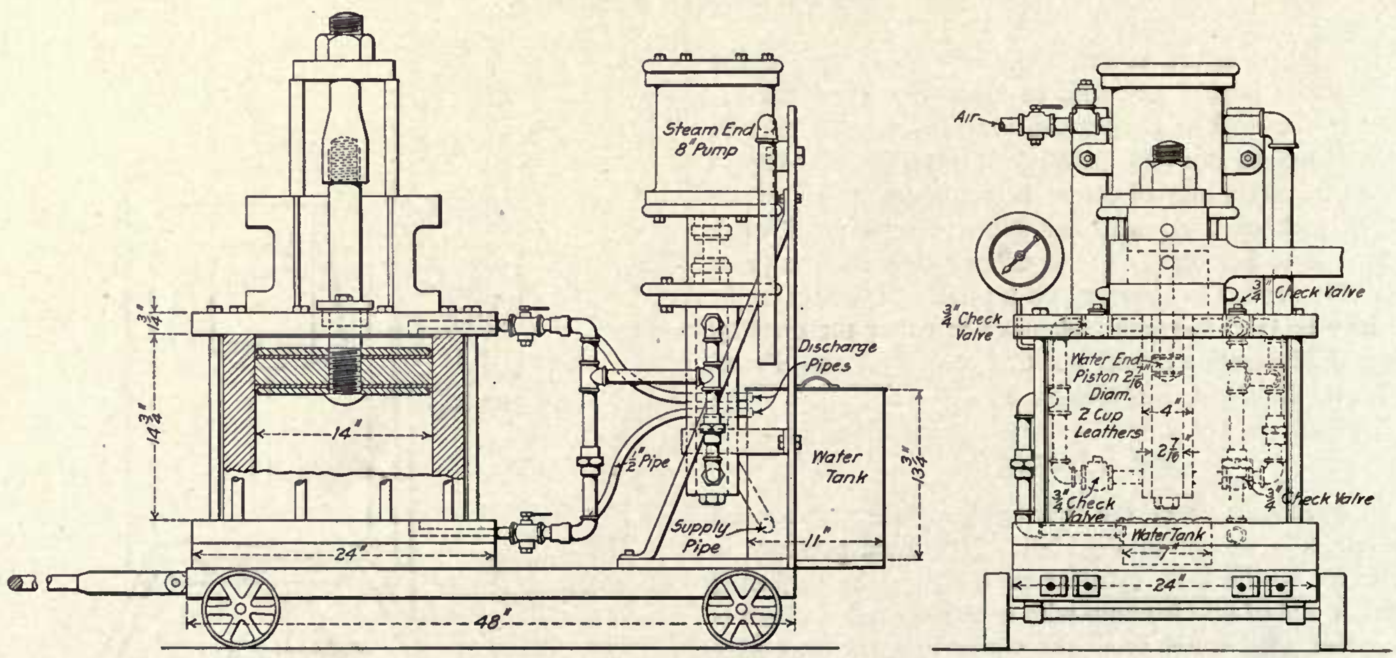



Fig. 302—Portable Hydraulic Press.

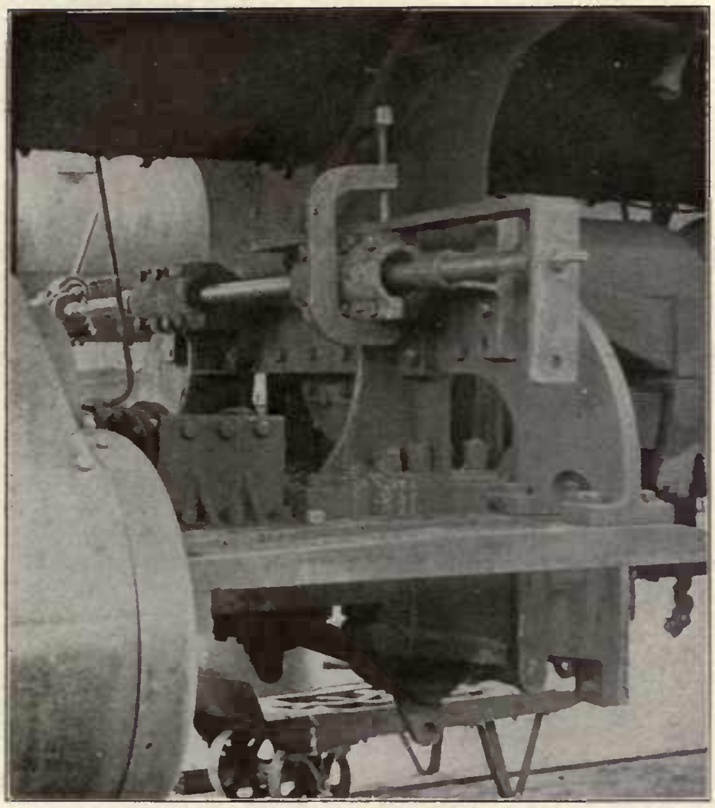


Fig. 304—Rocker Box Boring Bar.

*Draftsman; Thomas Marshall, Master Mechanic, and Henry Holder, General Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

### SHOES AND WEDGES, LAYING OFF.

In laying off shoes and wedges it is necessary to do a large amount of work with trams, straight-edges, parallel strips, etc. The shoe pop marks must be layed off

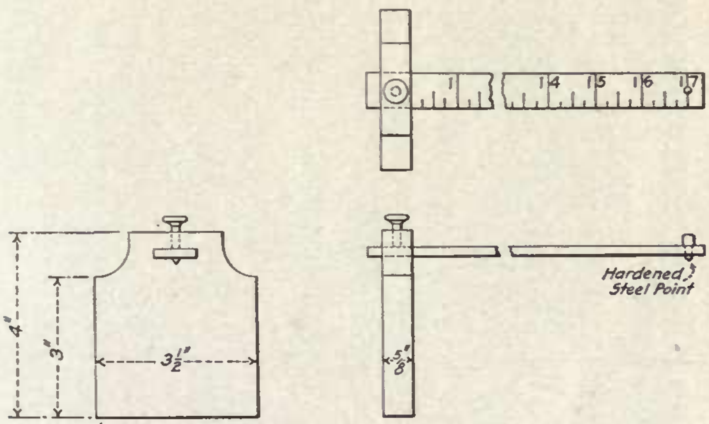



Fig. 305—Tool for Making Wedge Pop Marks.

with long, adjustable trams. The wedge pop marks, however, being layed off from their respective shoe pop marks, require only a short tram, and again, as these points do not affect the rod lengths, absolute accuracy is not necessary. The tool here illustrated, Fig. 305, is designed for this latter work. The main part of the tool is made either of wrought iron or soft steel, though the latter is preferable as there is less chance of its being affected by rough usage. The scale may be run through the head, as shown, or it may be clamped against the head with a stirrup bolt, the design shown, however, being preferable. For use the scale is set to the length desired and the head is held against the shoe face, as in the plan view. By lightly tapping the hardened steel pointer the desired pop mark may be made on the wedge. This method is much quicker than using a small pair of trams to locate the point and then using a prick punch for making the pop mark. The scale may be laid off to suit any conditions, and in both directions if desired. This tool may also be used in a variety of cases as a depth gage or for laying off frame holes, but it was designed especially for the purpose above described.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### STEAM PIPES, DRILLING HOLES IN FLANGES.

A convenient apparatus for drilling holes in steam pipe flanges is shown in Fig. 306. The steam pipe is held rigidly with the face to be drilled in a horizontal position,

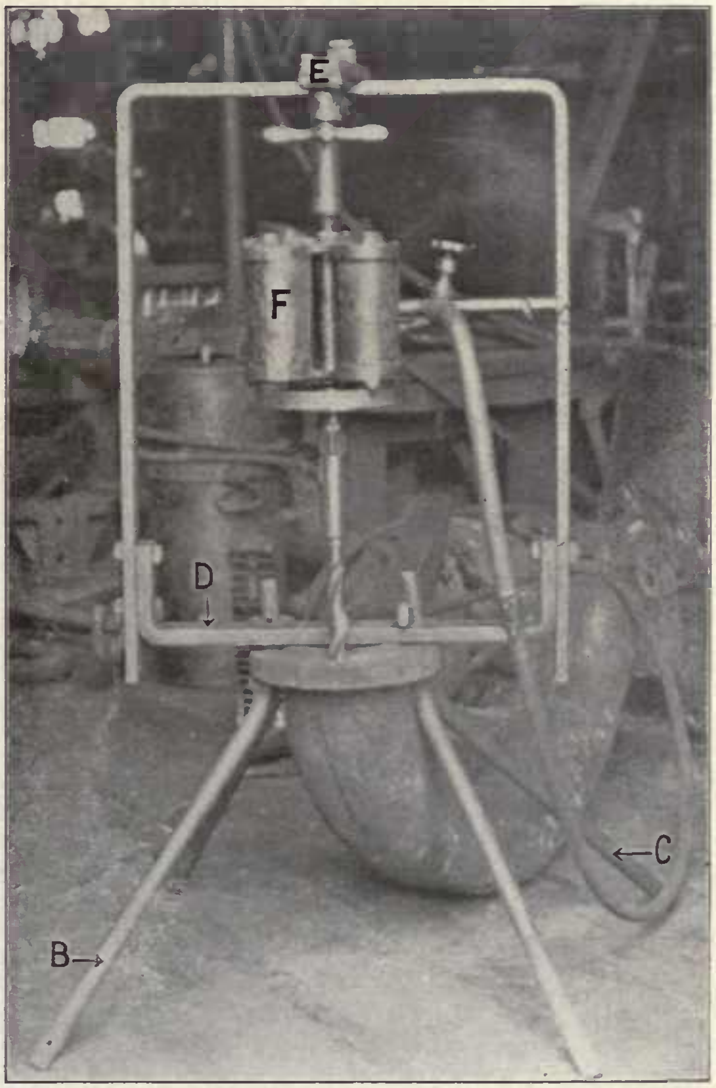



Fig. 306—Drilling Holes in Steam Pipe Flanges.

by means of the two pairs of legs *B* and *C*, the upper parts of which are inserted through the two holes in the steam pipe and are keyed down to the frame *D*. At the top of *D* is a flat piece of iron *E*, which supports the top of the motor *F*. This support extends out sufficiently to allow the proper adjustment to the motor in locating the center of the hole to be drilled.—*Chicago & North Western, Chicago.*

STEAM PIPE JOINT RING GRINDER.

One of the most undesirable jobs in overhauling a locomotive is that which has to do with the removing and replacing of steam pipes. The insuring of steam-tight

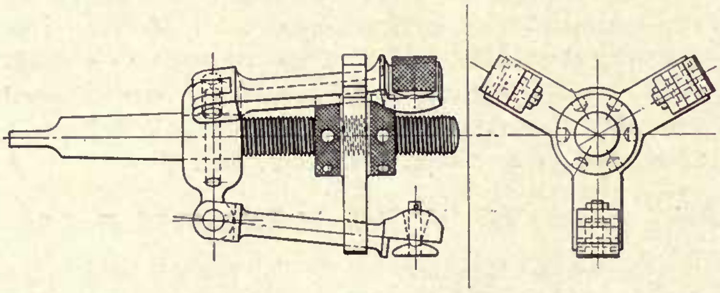


**Fig. 307—Steam Pipe Joint Ring Grinder.**

joints between the several sections of the piping is most important and any tool or device which will assist in grinding the joint ring is a welcome one. The tool shown in Fig. 307 is intended for use with an air motor, the shank having the standard Morse taper. It is adjustable and the three self-adjusting shoes accommodate themselves to the inner rough surface of the ring, gripping it tightly as the nut is adjusted on the screw, forcing the arms outward.—*Erie Railroad, Meadville, Pa.*

SMOKEBOX, DRILLING HOLES IN.

The apparatus shown in Fig. 308 is especially useful for drilling holes of small diameter when it is not con-

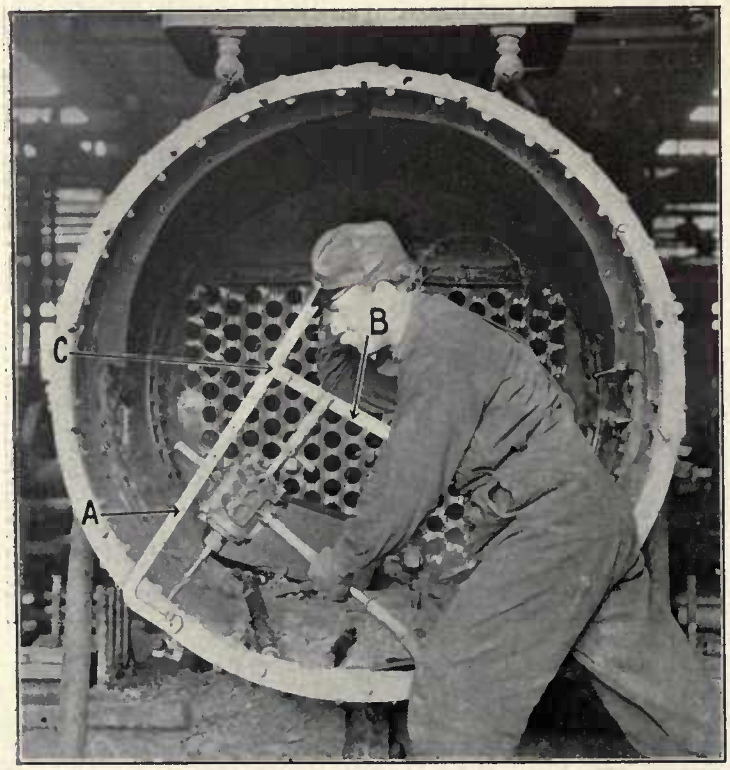



**Fig. 308—A Handy Device for Drilling Small Holes in the Smokebox.**

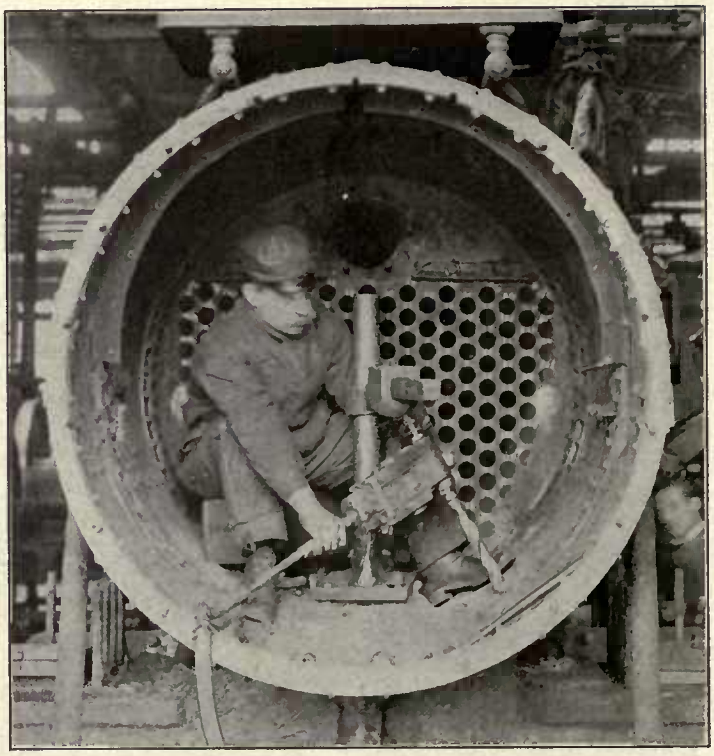


**Fig. 309—"Old Man" with Ball-Bearing Head for Drilling Saddle Bolt Holes.**

venient to use an "old man." The long piece *A* is hooked over a stud or bolt at its lower end and is held at the upper end by the workman's right hand. The crosspiece *B* is pivoted to *A* at *C* and is pressed down on the slotted

**Fig. 310—Extension Ball for Supporting Air Motor.**

top of the motor by the weight of the workman's body. The "old man" with the ball-shaped head shown in Fig. 309 is used for drilling the saddle bolt holes in the front end. An extension bar for supporting an air motor in drilling holes in the boiler at any angle is shown in Fig.

310. This extension is adjustable and may be used in any size boiler.—*Chicago & North Western, Chicago.*

STUD WRENCH.

An effective form of wrench for removing studs is shown in Fig. 311. It is made of steel, the stirrup and the indicated portion of the bar being finished. The stir-

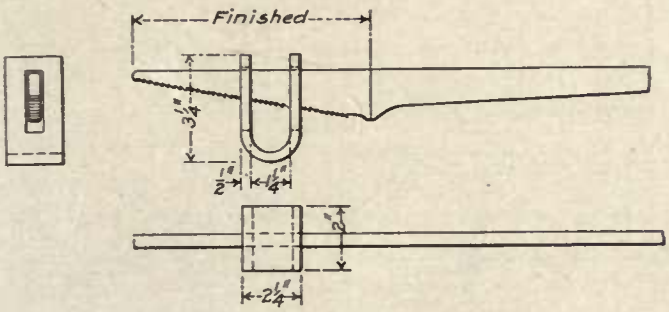



**Fig. 311—Wrench for Removing Studs.**

rup here shown will take studs up to 1¾ in. in diameter. The adjustment is rapid and the tool is exceedingly useful.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

STUD WRENCH.

A steel tool for applying and removing studs is shown in Fig. 312. A 1½-in. hole is drilled in the center of the hinged portion, and teeth are filed along half of the circle opposite the hinge pin. The swinging portion is slotted to receive the lever, which also has teeth filed on its rounded end. The swinging part and the end of the

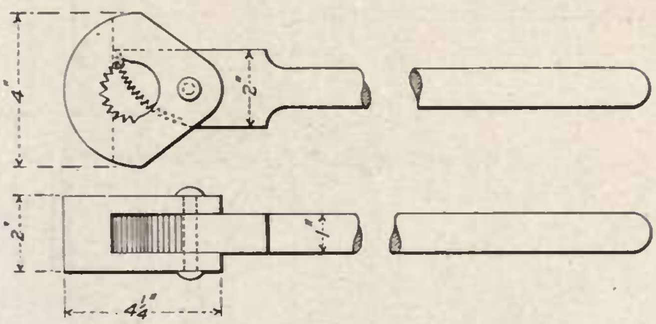


**Fig. 312—Stud Wrench.**

lever which engages the stud are case hardened. The ease with which this tool can be adjusted, its simple construction and great strength as compared to the ordinary alligator or Stilson, make it an efficient and useful tool.—*A. S. Willard, Foreman, Norfolk & Western, Crewe, Va.*

TIRE AND FRONT END CLAMPS.

Simple clamps used in handling tires and front ends with the shop crane are shown in Fig. 313. The tire clamps have hooks that grip the flange. The arm which bears against the inside of the tire has an extension end which, being bent outward, provides pressure when the tire is lifted on both the flange and inside of the tire. The clamp used on the front end is similar to those often used for handling boiler plate. The hook, which grasps the door, is assisted by the lever action of the central piece. The third piece is not necessary. The chain may

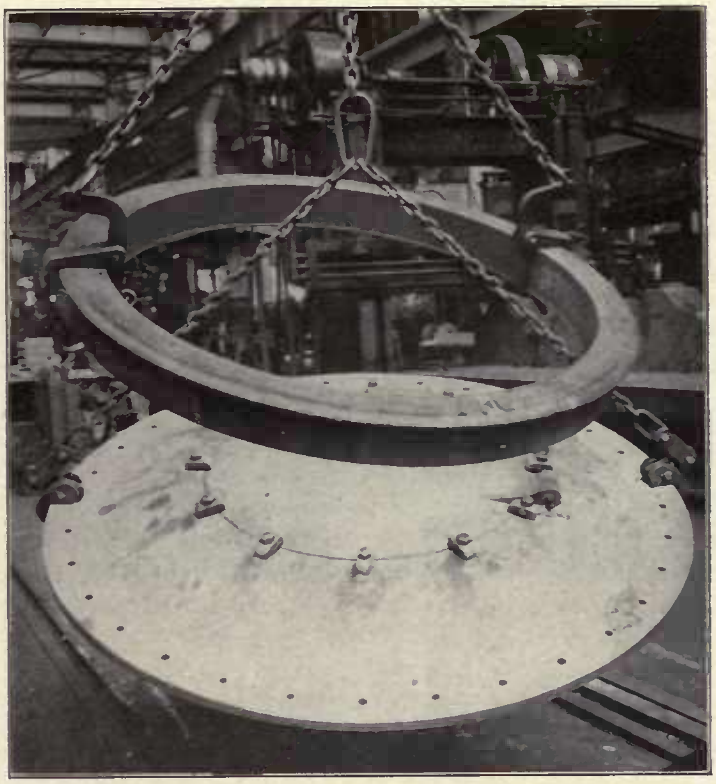


**Fig. 313—Clamps for Lifting Tires and Front Ends.**

be attached direct to the lever, which is supplied with teeth on the other end that grip the metal.—*Lehigh Valley, Sayre, Pa.*

TIRE TRUCK.

A simple tire carrying wagon is partially shown in Fig. 314. The wagon is pushed over the tire, straddling it, and the handle is elevated, thus lowering the upright and allowing a pin to be passed through the two parts

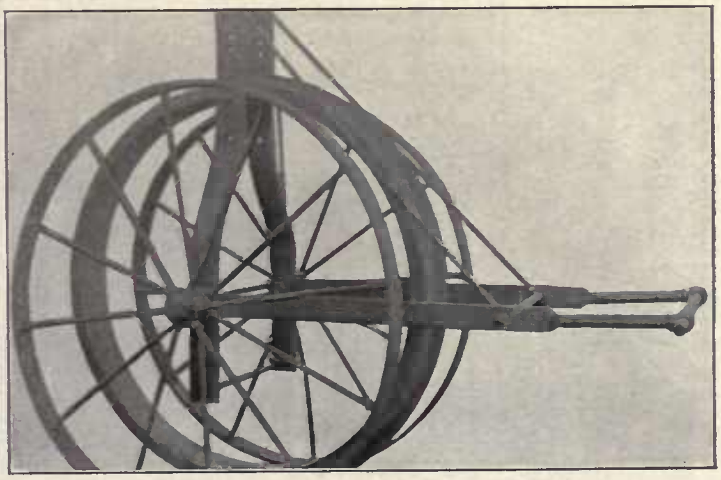


**Fig. 314—Driving Wheel Tire Cart.**

of the upright and below the inner side of the tire. By lowering the handle the tire is raised a short distance above the floor. The wheels of the wagon are 56 in. in diameter. The upright is constructed of 4 by 1 in. iron;

the handle bars are 3 in., by ¾ in., and are forged round at the outer ends as shown. The uprights are braced to the handle bars by the ¾-in. iron rods.—*T. E. Freeman, General Foreman, and A. G. Wright, Master Mechanic, Chicago, St. Paul, Minneapolis & Omaha, Sioux City, Iowa.*

### TIRE TRUCK.

A driving-wheel tire carrier is shown in Fig. 315. This carrier and a tire of the largest size can be handled with ease by three or four men, while the old method of rolling the tires required six or seven men, with the ever-present danger of injuring some one. As will be seen, the wheels are built up and can be made in any shop. Our carrier has been in service over a year, and the wheels are in just as good shape as when built. The tire is hung on pin *A* which is placed through holes in the upright and underneath the rim where the handle of the truck is raised, which lowers the upright. Pin *B* is placed through the holes in the handle bars to keep the tire from swinging as it is being moved about.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

### TRUCK FOR LONG MATERIAL.

Those who are familiar with the work in an erecting shop or engine house will at once realize the advantage of having at the disposal of the workmen a steel cart adapted for carrying long material such as tubes, pipes, rods, etc. The body of the cart, shown in Fig. 316, is made of ½-in. steel, reinforced at the top of the side

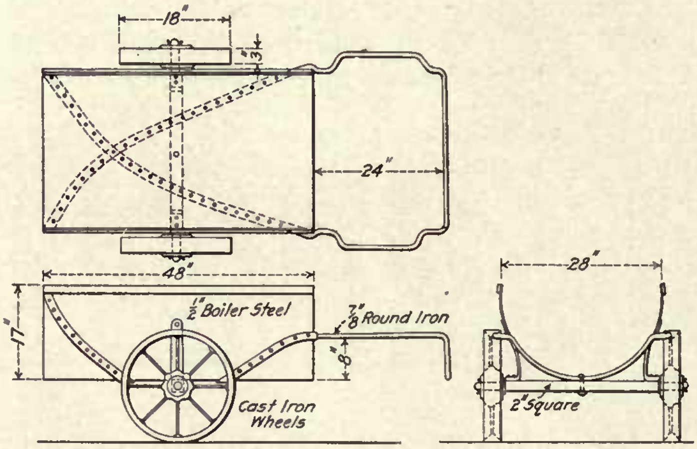



Fig. 316—Steel Cart for Transporting Long Material.

by pieces of bar iron. The handle is constructed of ⅞-in. round iron and is formed so that long material can extend out over it and at the same time leave a portion at the sides unobstructed. The material from which the handle is made is flattened out and riveted to the body of the cart as shown, in order to add to its stiffness and strength. The cast iron wheels are 18 in. in diameter

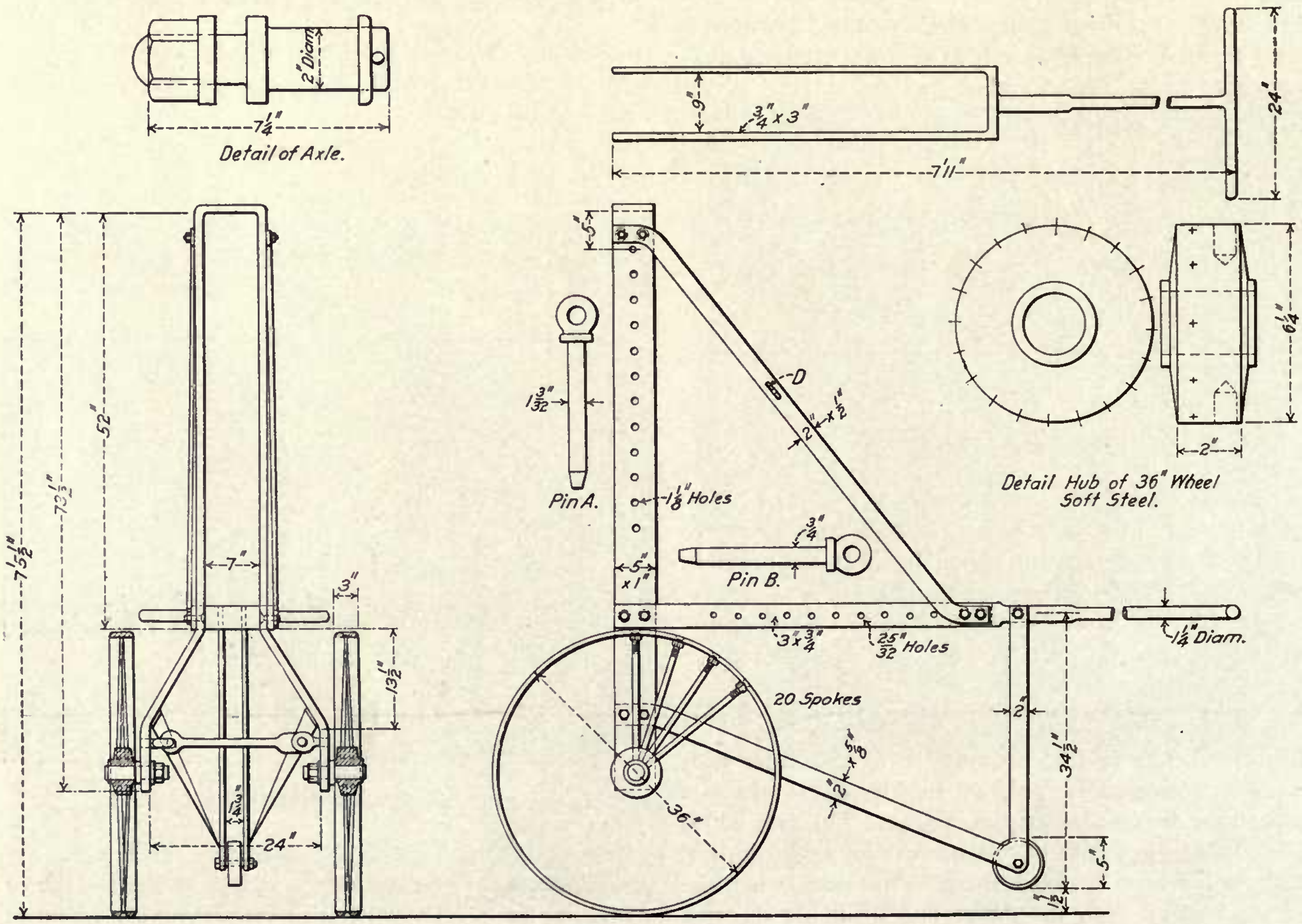



Fig. 315—Driving Wheel Tire Truck.

and have a tread 3 in. wide, thus making the cart easy to move over rough floors, or on the ground outside the building.—*A. G. Pancost, Elkhart, Ind.*

### VALVE CHAMBER BUSHINGS, HYDRAULIC PRESS FOR.

A hydraulic press for pressing in or removing valve chamber bushings is shown in Fig. 317. The piston of the ram is forced out by hydraulic pressure supplied from a portable accumulator. The cylinder of the ram is connected to the hand-operated accumulator by a copper pipe. This gives a high, even pressure that applies or removes bushings quickly. It formerly required a mechanic and helper 6 hours to apply a bushing with the old methods in vogue. The cost of this operation was $3.24, or $6.48 per engine when 2 bushings were applied. By the use of the hydraulic press the time of applying a bushing was reduced from 6 to 2 hours, making a saving of $2.16 per bushing, or $4.32 per engine. An average of 240 bushings are applied per year, which, at a saving of $2.16 apiece, makes a total saving of $518.40 by the use of this device.—*E. J. McKernan, Supervisor of Tools, Atchison, Topeka & Santa Fe, Topeka, Kan.*

### VALVE-FACING MACHINE, AIR MOTOR HOLDER FOR.

In setting up a rotary valve-facing machine the mechanic usually has no particular method for holding the

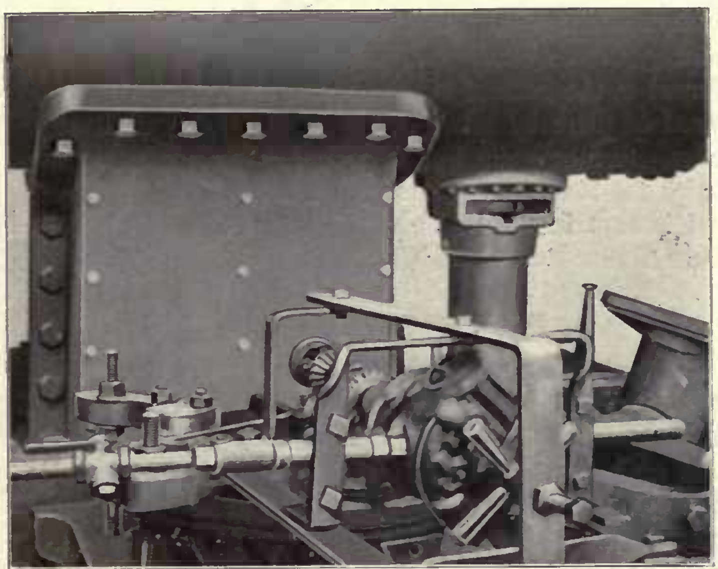


Fig. 318—Air Motor Holder for Valve-Facing Machine.

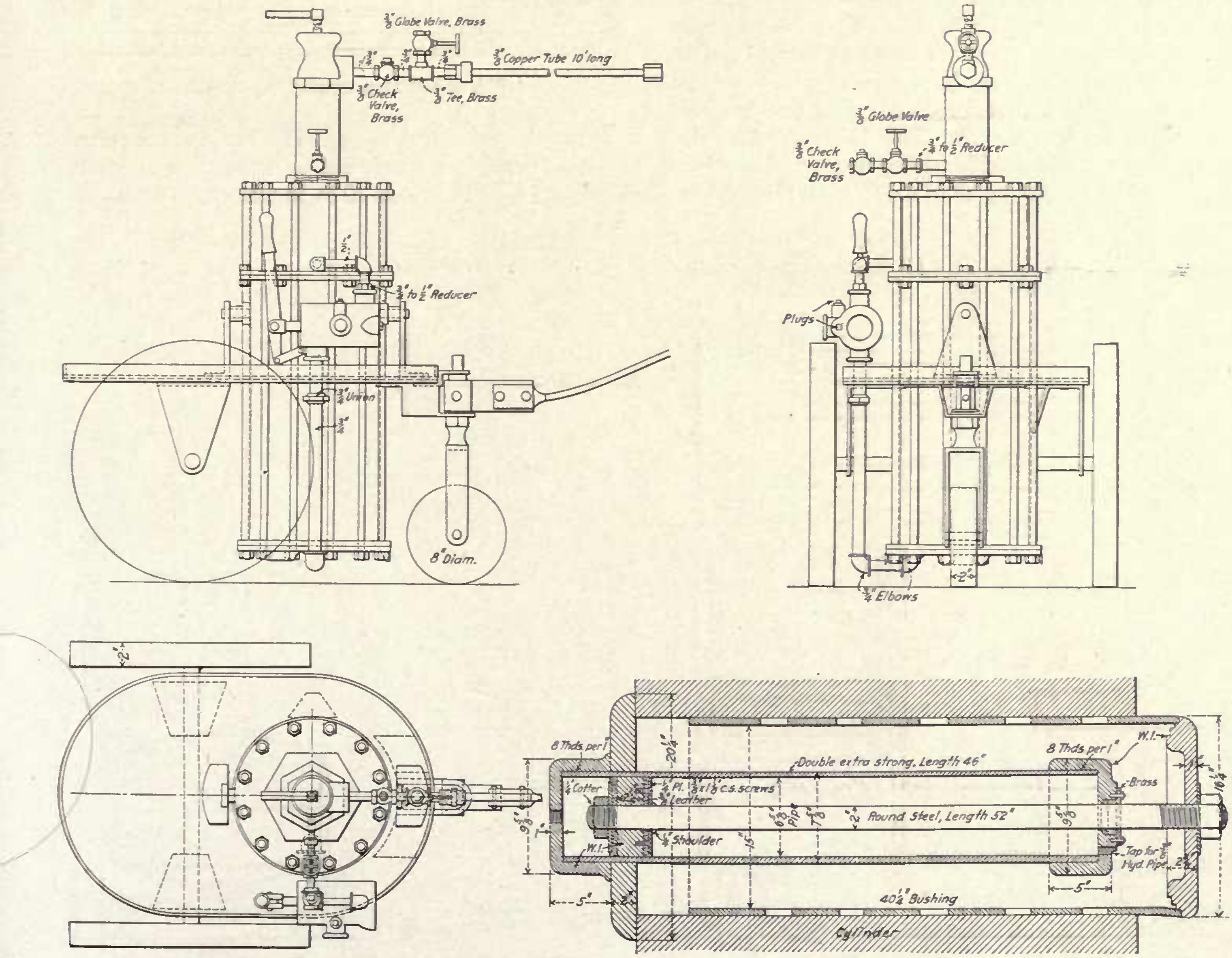



Fig. 317—Hydraulic Press for Valve Chamber Bushings.

air motor. A common method is to rest the motor on a wooden strip extending from the floor, and to prevent side motion by guying the feed screw handle with a couple of ropes. This method answers the purpose, but it takes time to arrange it. The illustration, Fig. 318, shows a holding device which is made of rough strips of iron shaped to the general outline of the air motor. It is secured in place by being bolted to the steam chest stud holes. Arrangement is also provided for a stop against which the feed screw bears. This device is a time saver and is kept in the tool room.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### VALVE SETTING APPARATUS.

A simple but efficient machine for turning the drivers in setting valves is shown in Fig. 319. It is driven by an air motor, and the reducing gears are similar to those used on a portable cylinder boring machine. The efficiency of the valve setting apparatus can be very greatly increased by taking proper care of it. In many erecting shops and engine houses the practice is to toss it to one side after it has been used. The result is that when it is necessary to place it under another engine, more or less time is lost in locating it. Then again, the different parts of the apparatus may have become separated and the trams and other tools may have been misplaced or lost. To overcome this a portable double steel box has been built, as shown in Fig. 320. This is arranged so that the apparatus can be quickly packed away, and provision has been made for placing all of the tools and instruments used in connection with valve setting in it. When this has been done the boxes are locked and the portable truck

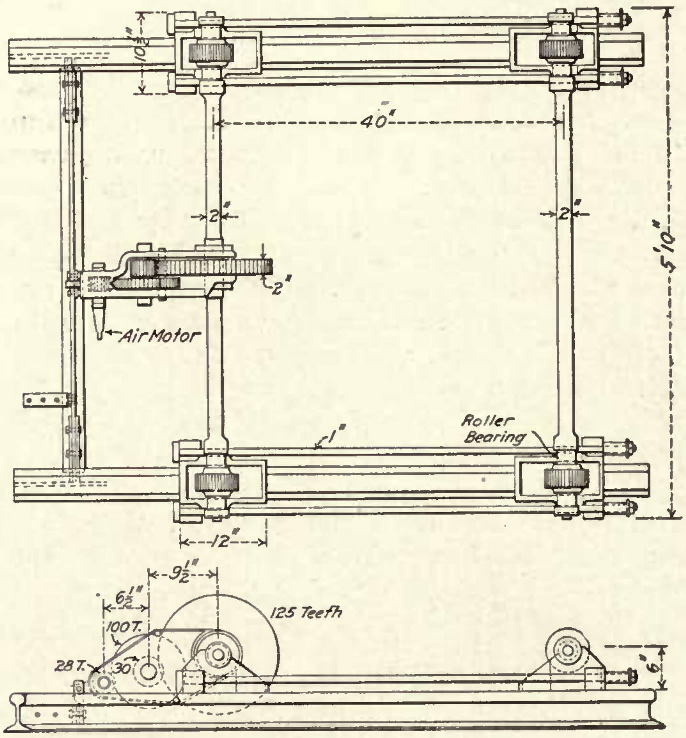



Fig. 319—Valve Setting Machine.

is returned to the tool room. The box is constructed of ⅛-in. steel plate, reinforced by wrought iron bands, as shown. The wheels are 10 in. in diameter, with a 2½-

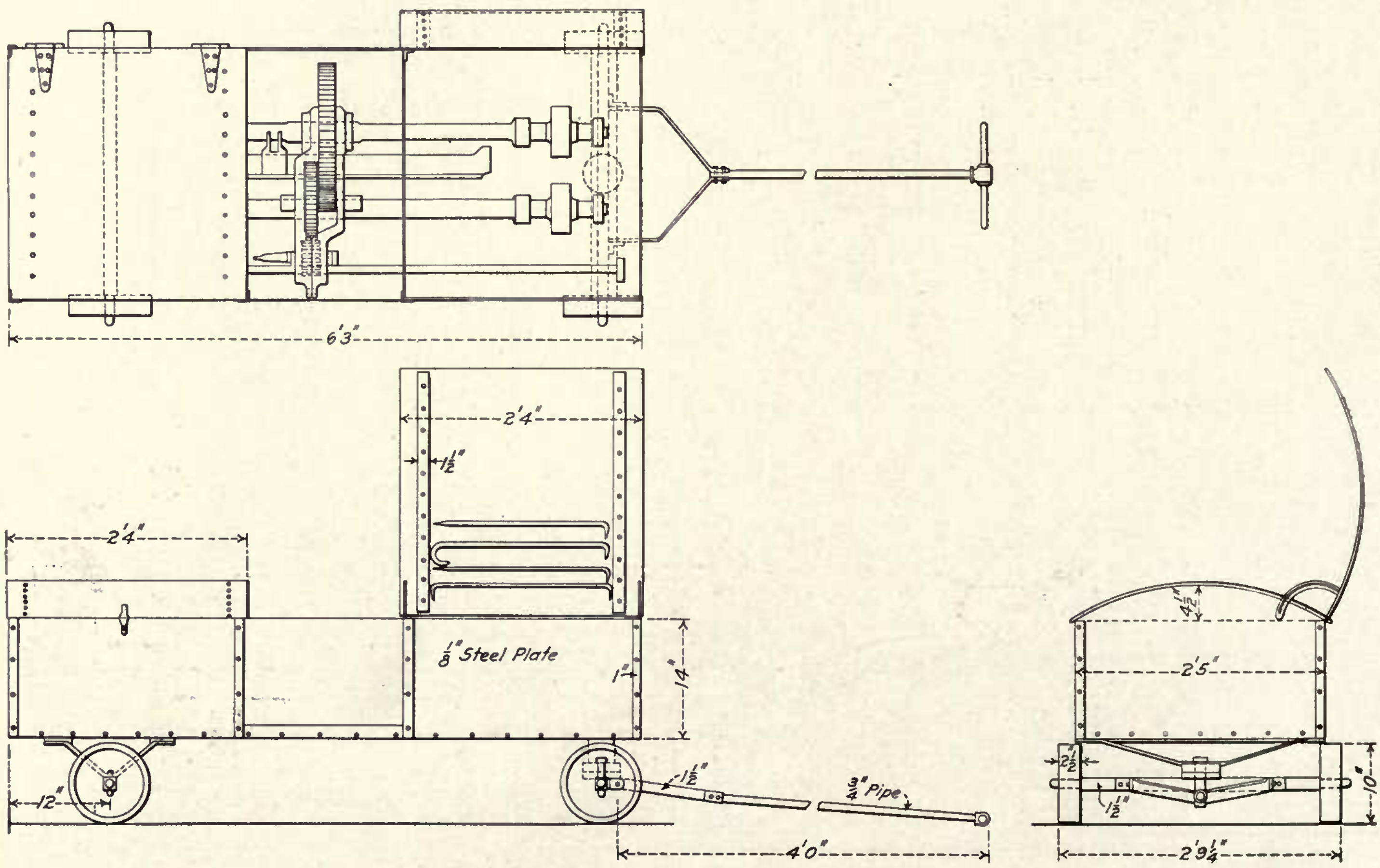



Fig. 320—Portable Steel Box for Valve Setting Machine and Tools.

in. tread.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

VALVE SETTING MACHINE.

An arrangement for rotating driving wheels of locomotives while setting the valves is shown in Fig. 321. An air motor drives a set of spur and bevel gears which rotate the shaft carrying the rollers. The wheels may be rotated in either direction by shifting the gears, provision

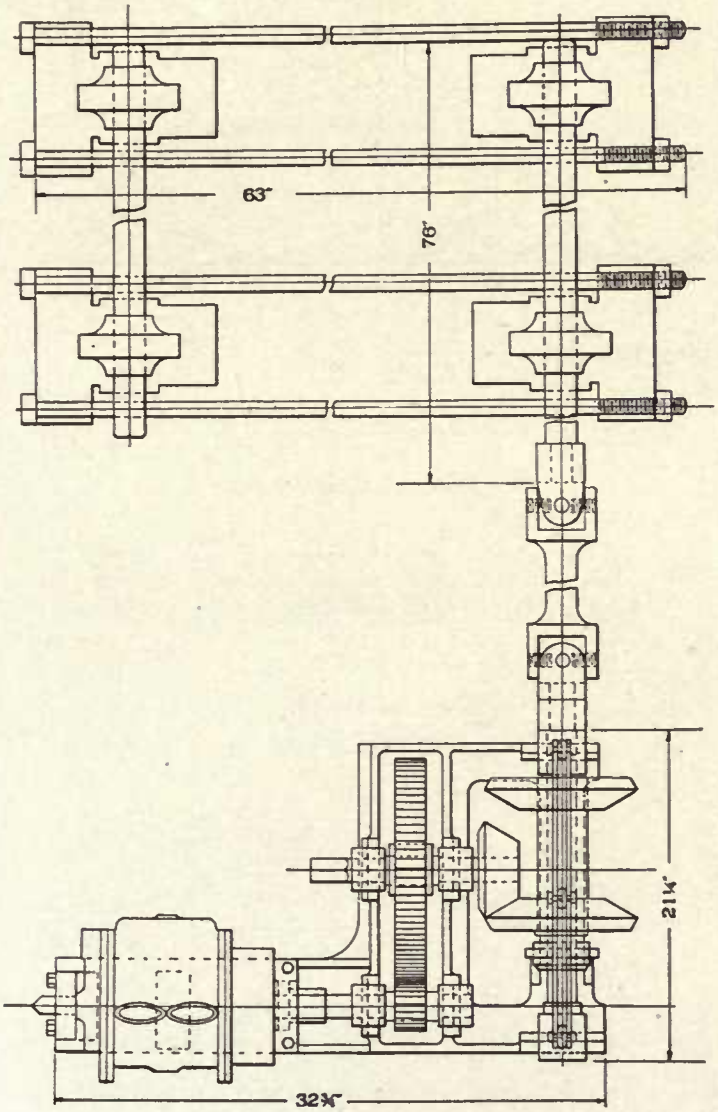


Fig. 321—Valve Setting Machine.

for which is provided as illustrated. The weight of the engine should be taken off the main drivers by blocking between the saddles and frame in the usual manner.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

VALVE SETTING MACHINE.

A unique valve setting machine is illustrated in Fig. 322. There are several different kinds of valve setting machines, but we have never seen one applied so readily as this one. The important feature of the machine is the gear box. It is light in construction, but very effective. It is geared six to one, allowing the driving-wheel to travel about 15 ft. per minute. To detach it from the shaft loosen the set screw collar *A* located at the end of the shaft. This being done, the gear box can be removed by sliding it out along the shaft. The gears are covered with a neat case made from No. 14 iron. Power

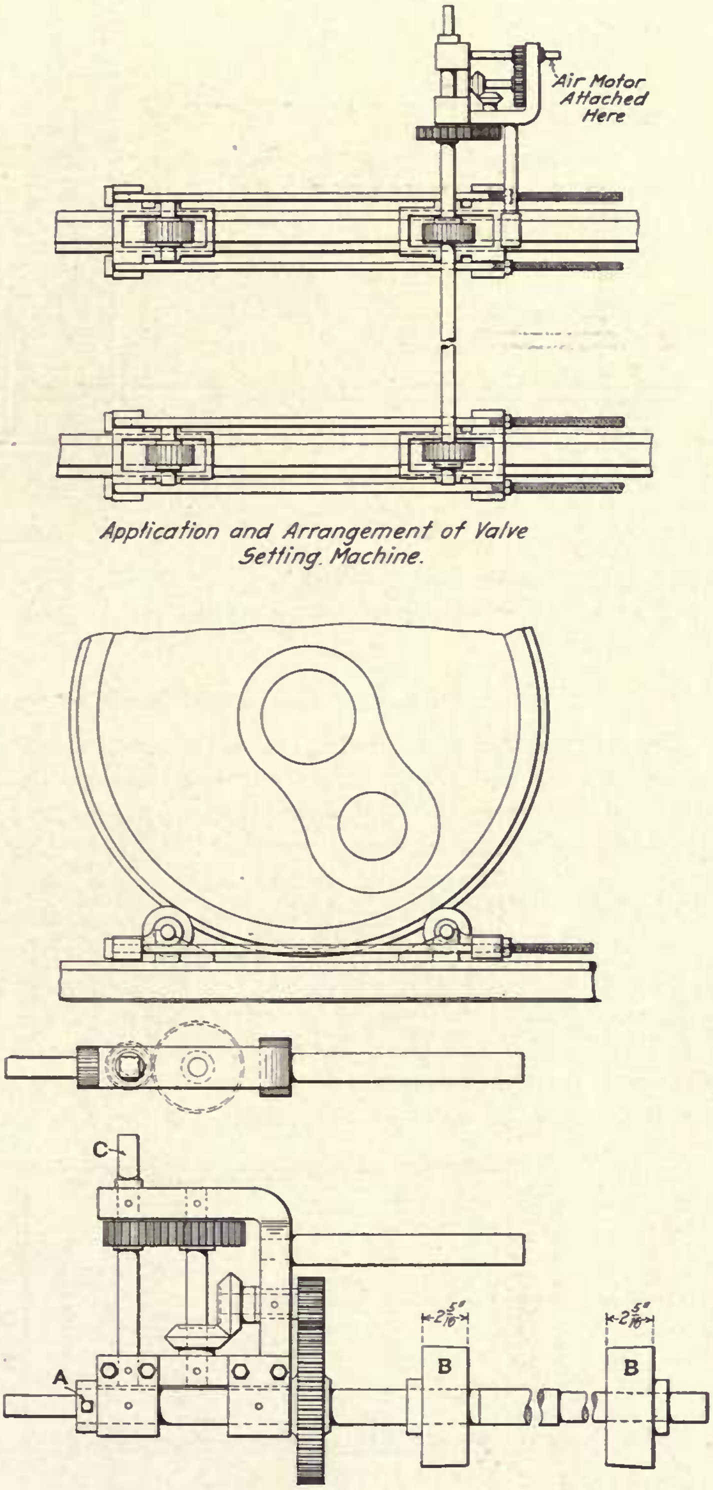


Fig. 322—Valve Setting Machine.

is transmitted from an air motor which is attached at *C*.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

VALVE SETTING MACHINE.

An exceedingly simple arrangement for revolving the driving wheels during the process of valve setting is shown in the accompanying diagram, Fig. 323. The shaft is extended out on one side and is fitted with a worm gear, into which a worm meshes. The stem of the latter is made to fit an air motor, which may be attached and used as a driver.—*Delaware, Lackawanna & Western, Scranton, Pa.*

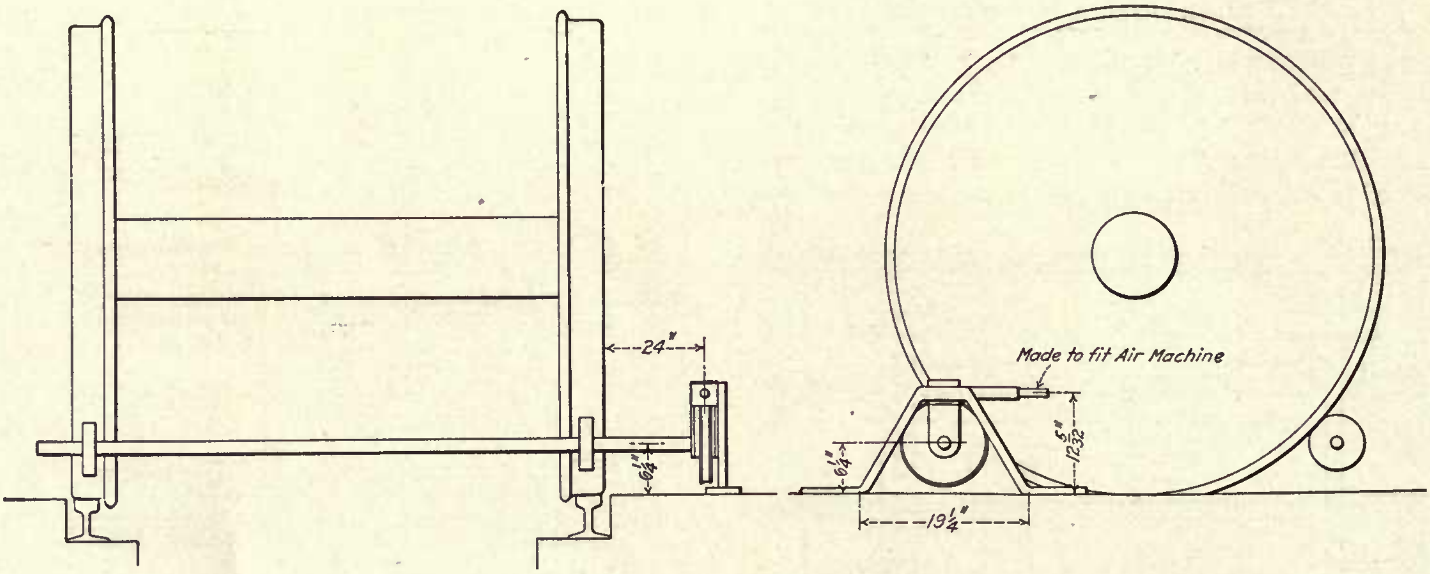



**Fig. 323—Valve Setting Machine.**

VALVE SETTING, WALSCHAERT VALVE GEAR.

The usual practice of setting valves on locomotives equipped with Walschaert valve gear is to change the length of the eccentric rod three-quarters of the amount the valve is shown to be out of square. The rod is then removed and a cut and try method used, which takes considerable time and labor. This may be eliminated by using the device shown in the illustration, Fig. 324. It consists of an adjustable eccentric rod and an adjustable union link. The original eccentric rod and union link are removed and the adjustable devices are put in their places. These are adjusted to the proper lengths for the correct position of the valve. The centers *A* and *B* on the ends of the adjustable rod eliminate the necessity of having to find the centers each time. The proper lengths being obtained, the original rods are made

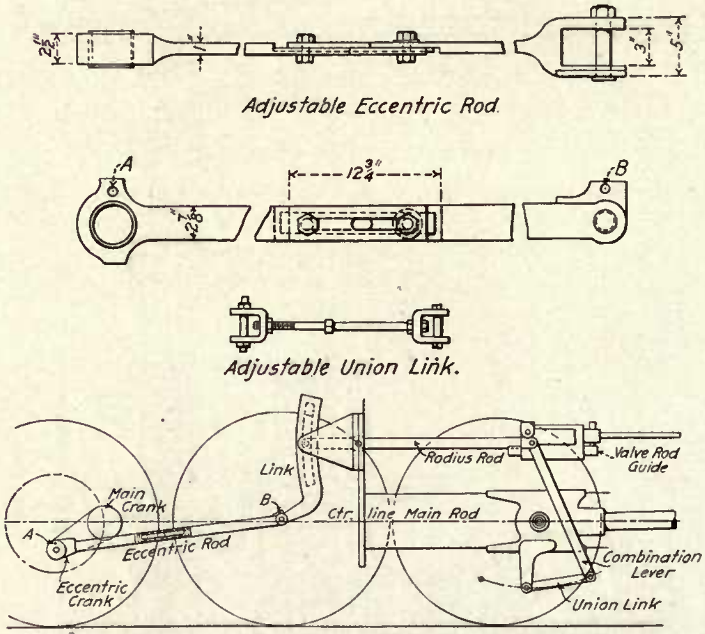
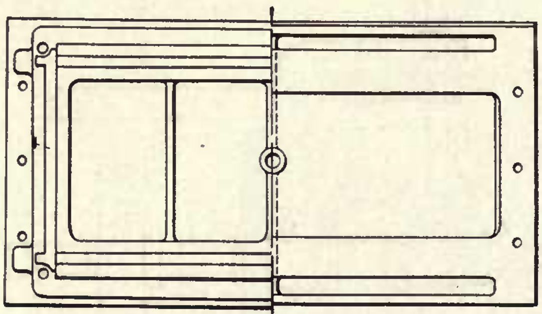



**Fig. 324—Device for Setting Walschaert Valve Gear.**

to correspond.—*H. F. Grewe, General Foreman, Wabash-Pittsburg Terminal Railway, Rook, Pa.*

VALVES, GAGES FOR FINISHING AND INSPECTING SLIDE.

For each size of slide valve in use there is a gage that contains all the essential measurements of the valve for



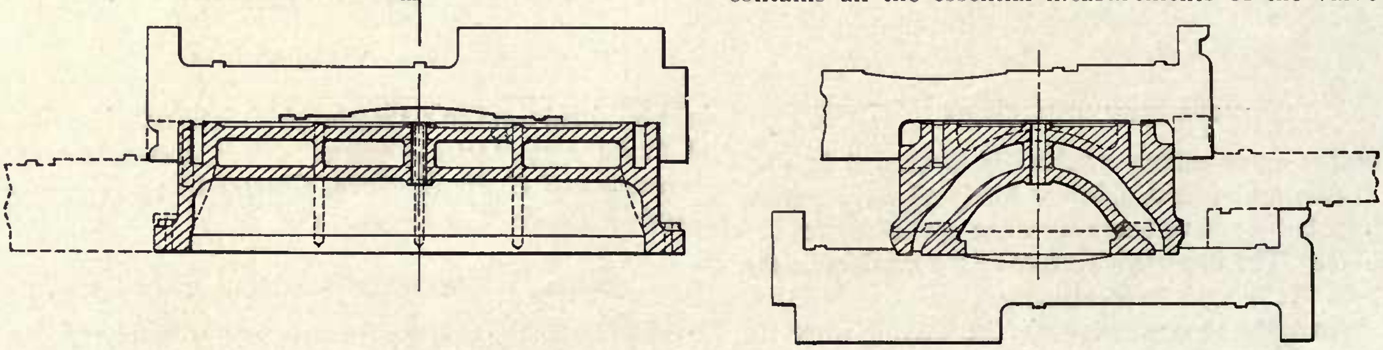


**Fig. 325—Application of Gage for Inspecting Slide Valves.**

which it is intended. Two examples of these gages are shown in Figs. 325 and 326. 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 the 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.—*Delaware, Lackawanna & Western, Scranton, Pa.*

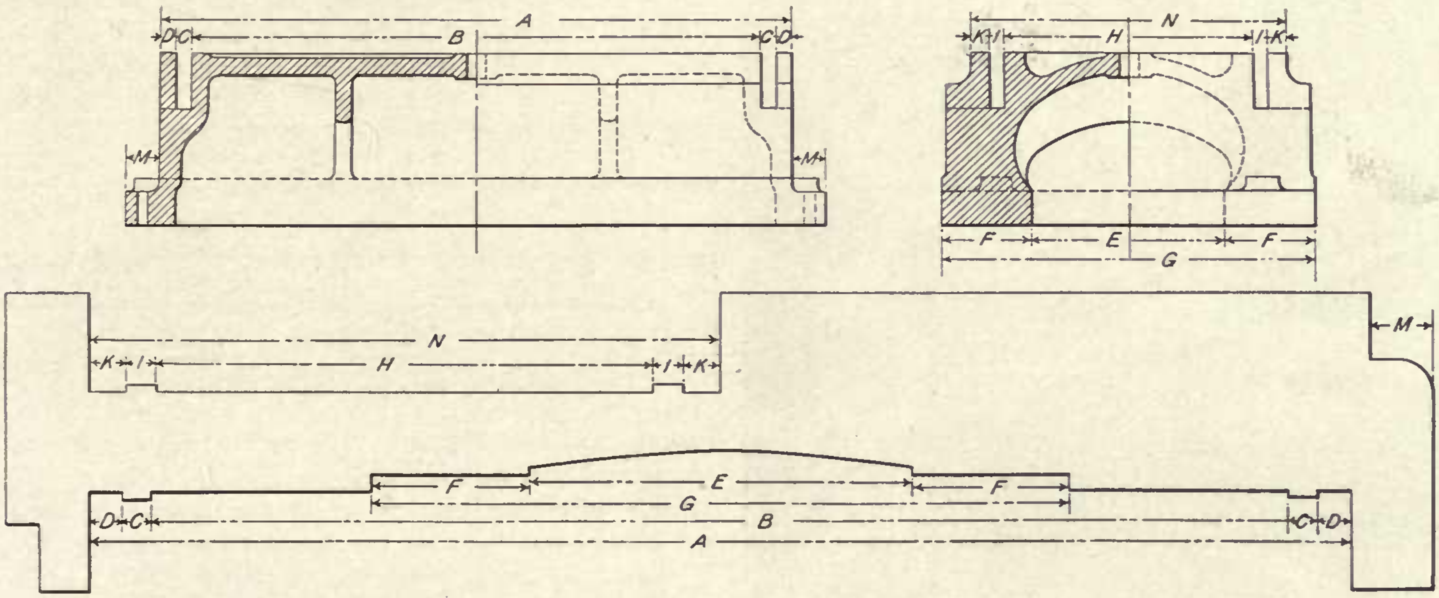



Fig. 326—Gage for Inspecting Slide Valves.

WHEEL AND AXLE JACK.

An air jack for raising and turning mounted driving wheels at track intersections is shown in Fig. 327. It is simple and inexpensive. The top section of the ram and the fork on which the axle rests may be removed when the jack is not in use, so as not to obstruct the floor or track. The air cylinder has an inside diameter of 14 in. The stroke of the piston is 16 in., although the admission of air to the cylinder may be regulated by the air valve so that the wheels are only lifted a short distance above the floor. The piston rod is made of 5-in. pipe.—*T. E. Freeman, General Foreman; A. G. Wright, Master Mechanic, Chicago, St. Paul, Minneapolis & Omaha, Sioux City, Iowa.*

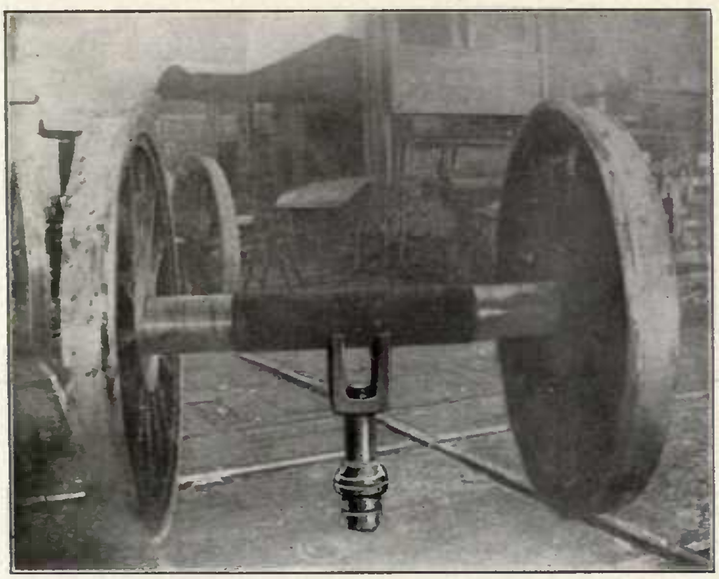


Fig. 327—Air Jack for Turning Mounted Driving Wheels at Track Intersections.

WHEEL AND AXLE JACK.

A small track jack, used for lifting heavy tender truck and engine wheels and axles, so that they may be turned and run from one track to another when the tracks stand at right angles to each other is shown in Fig. 328. The jack is low, so that a wheel with its axle can be rolled over it when it is down. The cap of the jack has been removed and a semi-circular yoke riveted in its place. This yoke is of such size as to accommodate the center of the axle and may be made of 1-in. by 4-in. iron. The wheels and axle are rolled over it and the jack is raised lifting the wheels from the rails, when they may easily be turned to the proper position.—*A. S. Davis, Shop Foreman, Northern Pacific, Jamestown, N. D.*

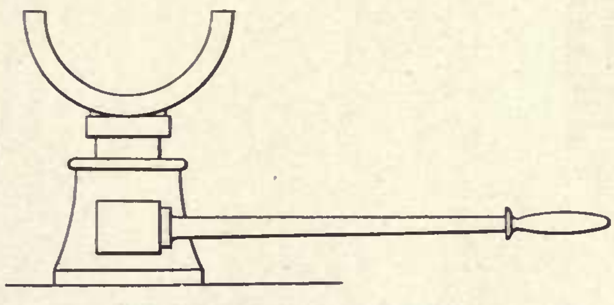


Fig. 328—Wheel Swinging Jack.

WHEELS, DRIVING, MOUNTING PROPERLY.

A shop kink which is used to great advantage in testing the proper location of crank pins in relation to the keyway when pressing a wheel on an axle is shown in Fig. 329. The lower inside center *A* is placed on the center line of the keyway. The upper point *B* is in the same vertical plane and furnishes a guiding point in pressing the wheel to its correct position on the axle. The point *B* should be in the center of the crank pin when the point *A* is on the center line of the keyway.—*Chicago, & North Western, Chicago.*

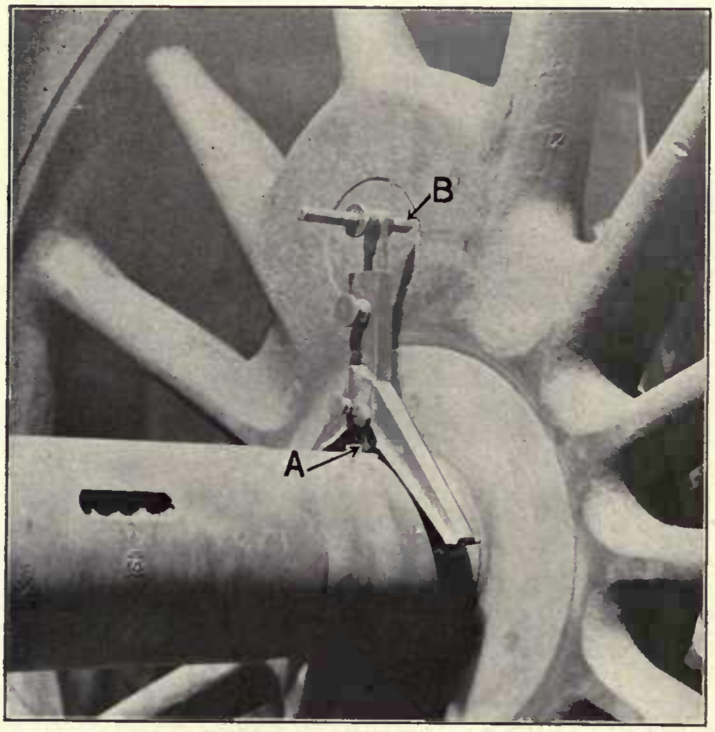



**Fig. 329—Tool for Checking Proper Location of Driving Wheel on Axle.**

WHEELS, LATERAL MOTION GAGES FOR DRIVING.

The end play or allowance which is made for the lateral motion of locomotive drivers is usually measured with a stick and a rule. This method may be accurate, but it will bear close watching. It is almost compulsory that two men hold the stick, one at either end, as it is necessary to hold a straight-edge against the outside of the frame or shoe on one side. The tool here shown, Fig. 330, is in reality merely a specially designed scale for making this measurement. The square shoulder makes the second man with the straight-edge unnecessary. The outside adjustable head is set to the distance between the hub plates. In case the finished shoe castings are in place, the gage, when held with the inside of the square shoulder against the shoe casting, indicates the exact amount which must be taken up by the two box flanges, plus the side play or lateral motion allowance. Two sliding heads are provided, as there are a variety of ways by which a man may get the desired lateral motion allowance.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

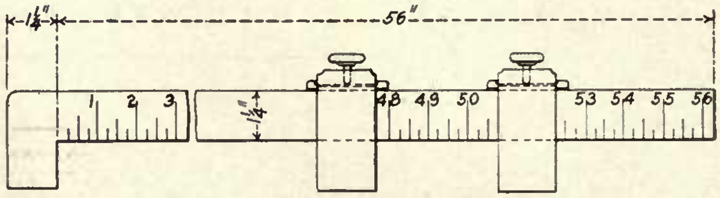



**Fig. 330—End Play or Lateral Motion Gage.**

# Boiler Shop Kinks

AIR MOTOR STAND OR SUPPORT.

A spring stand used in connection with air motors for hard work, such as reaming and tapping for crown bolts is shown in Fig. 331. It always takes a powerful machine to do this work, especially when the crown bolt is tapered. These machines weigh 60 lbs. and it requires one boilermaker and two helpers to support one of them. Every time they change position from one hole to another they have to lay the motor down and lift it up again. The drawing shows where the motor is connected to the stand. The springs are made with enough tension to hold up the motor, and can be pulled down to transfer the motor to another hole. The spring tension also allows the motor to follow a tap without crowding it. The 4 in. casing in which the spiral spring, about 24 in. long, as contained is screwed into the base plate, which is 8¼ in. in diameter, and into the sleeve at the other end. With this stand we do the work with one less man. It is light in construction; one man can carry it, and it does not take up much room. It can be regulated to any height by applying different length extensions.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

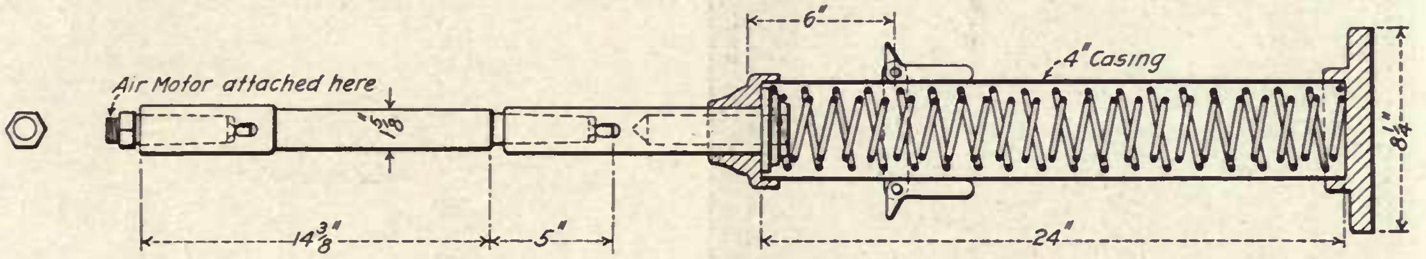



Fig. 331—Air Motor Stand or Support.

BENDING CLAMP.

A convenient bending clamp for use in the boiler shop is shown in Fig. 332. It consists of a cast iron base, supported at its ends on substantial wooden blocks. The clamp is a 12-in. steel I-beam, reinforced on either side along the web by ⅝-in. steel plates, which are riveted to the web. It is operated by the hand screws at each end, and is especially valuable where there is not work enough to warrant the purchase of a power clamp.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

BLUEPRINT FILING CASE.

A blueprint filing case in the boiler shop, in which are filed all the working blueprints required in the shop is

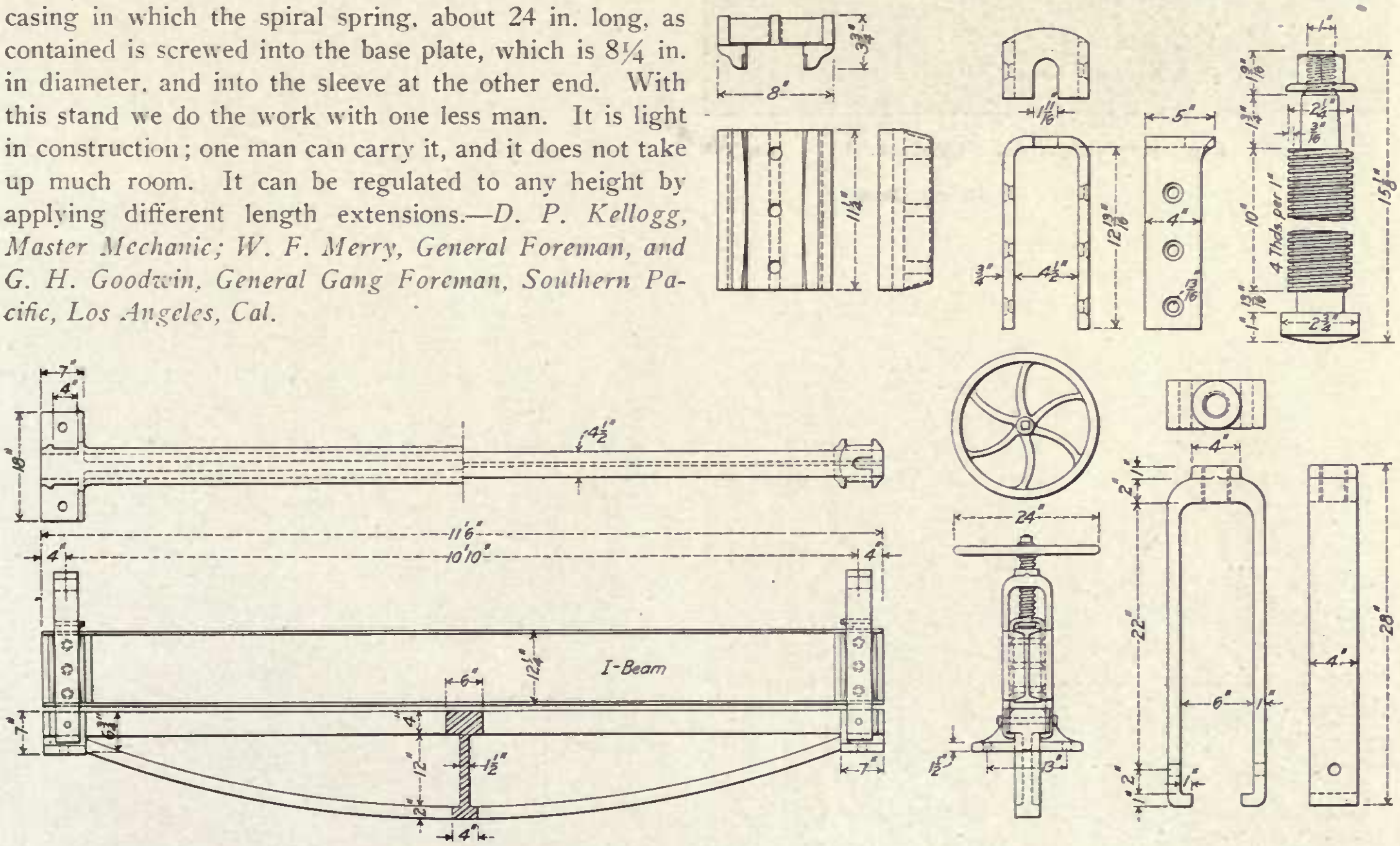



Fig. 332—Hand-operated Bending Clamp.

shown in Fig. 333. The case is substantially made of wood, with four partitions, which act also to strengthen it; the thin vertical partitions are made of light sheet iron. It will be noticed that the partitions are numbered serially from 1 to 46. When made it was the intention to keep a card index of the prints, but this was later found unnecessary, as the men very soon got to know the sizes

Fig. 333—Blueprint Filing Case.

of the various drawings and could locate a print easily in less time than they could refer to the index. Each print is mounted on heavy cardboard and varnished.—*Central Railroad of New Jersey, Elizabethport, N. J.*

### BOILER TESTING.

An alteration in the method of testing boilers was recently made at our shop. This work had been done by using a Philadelphia Rue injector, coupled to the branch pipe, making the test through the boiler check, and using a strong hose to supply the steam. The results were not satisfactory, however, as it was not possible to get more than 100 lbs. pressure, and the inconvenience and loss of time in moving the apparatus from one engine to another were considerable. There was also the ever present danger of a man being scalded by a bursting of the steam line.

The sketch, Fig. 334, shows the Rue injector and piping as rearranged for boiler testing. The injector was secured to the wall of the machine shop, on the pit side. The 2-in. service pipe extends to the shop water main. The steam pipe is 1¼ in. From this steam line a 1-in. pipe is run into the enlargement of the main piping to the boiler, for use only when filling the boiler. It is used in conjunction with the by-pass from the service pipe to heat the water for testing. The enlargement of the pressure line pipe where the 1-in. pipe enters allows the cold water and the steam an opportunity to mix before entering the boiler. After the boiler is filled the valves in the by-pass and in the 1-in. steam line are closed, and the injector is operated to force water and steam into the boiler, by which the pressure can be increased to 200 or 300 lbs. An ordinary pump could be used instead of an injector, although not so conveniently. A 2-in. pipe, to which the pressure line of the injector is connected, was then run along the ends of the pits, with short

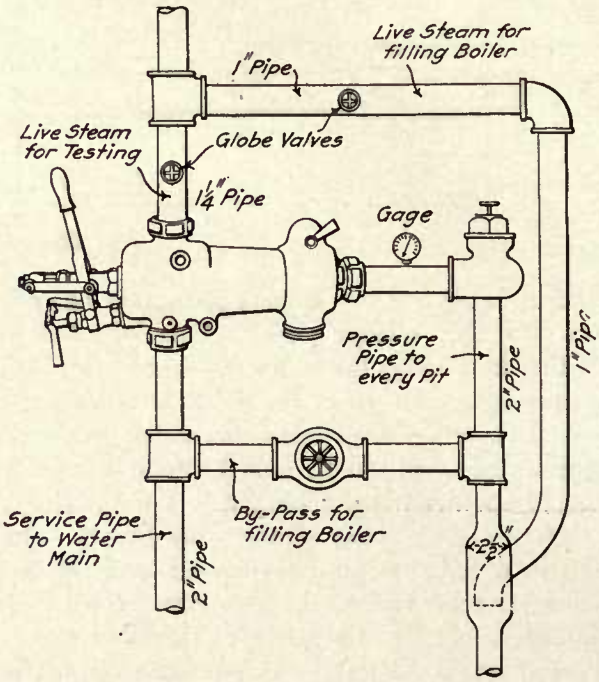



Fig. 334—Piping Arrangement for Testing Boilers.

branches and 2-in. foot cocks into the end of each pit. Nine-ply, wire-woven, 300-lb.-pressure hose is used between the foot cock and the blow-off valve of the engine to be tested. The water used for testing may later be used for another test by connecting the blow-off valve of the second engine back to the 2-in. line running along the ends of the pits, thus filling up another engine. By this method it is possible to test a boiler, after it is filled, in 15 minutes, one man doing the work; formerly it required at least two men and three hours' time.—*Theodore Rowe, General Foreman, Great Northern, Jackson Street Shops, St. Paul, Minn.*

### BOILER, PORTABLE PUMP FOR TESTING.

A portable hydraulic pump used in the erecting shop for testing boilers and in the roundhouse for testing steam pipes, valves, cylinder packing, etc., is shown in Fig. 335. The pump is mounted on a two-wheel truck and is made from an 8-in. air pump, the air cylinder of which is removed and a pipe substituted. Water is supplied to the pump from any convenient shop water line and the pump is operated by air pressure from the shop air line. Water pressure is controlled by four check valves and the amount of pressure is registered on a gage located in the water line to the boiler or steam chest. In testing steam pipes, valves, cylinder packing, etc., the pump is connected to the relief valve in the steam chest; it is connected, when testing boilers, to one of the washout plugs or blow-off cocks in the firebox. This pump has paid for itself many times in locating defects on engines giving unsatisfactory service.—*E. G. Gross, Master Mechanic, Central of Georgia, Columbus, Ga.*

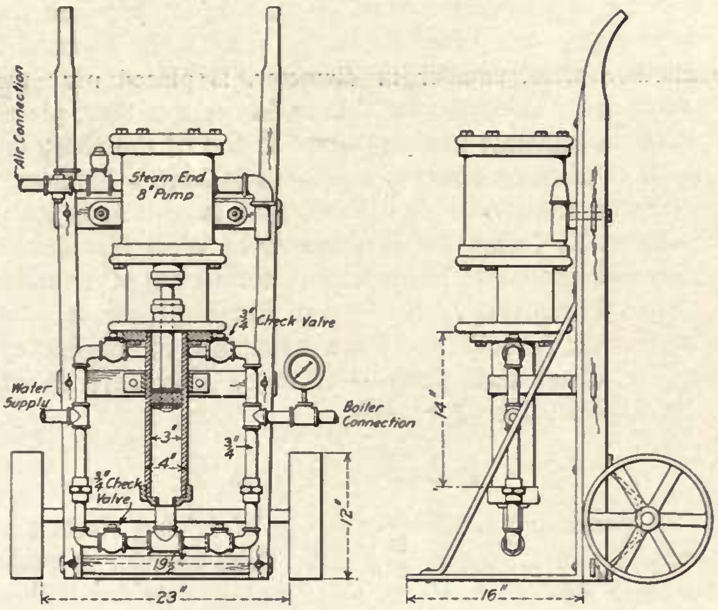



Fig. 335—Portable Hydraulic Testing Pump.

HOIST, AIR-ELECTRIC AT FLANGE FIRE.

For use over the large flange fire in the boiler department, and swinging from one of the building columns, is a 25-ft. crane girder, from which is suspended a 6-ft. air hoist, for handling the various boiler sheets to be flanged. This air hoist operates satisfactorily on sheets that are only required to be raised from the fire and dropped on the flanging form; but when flanging the upper half of a large throat sheet, it must be suspended and held in a vertical position, which necessitates one corner of the sheet being held 12 to 14 ft. from the floor. This is impossible with the use of the air hoist, as is clearly shown in Fig. 336. It was the custom to use the overhead traveling shop crane which is in constant demand in the machine bay, to hold a throat sheet until the entire upper half could be flanged, which required from one to two days. The handicap in the machine bay due to the holding up of this crane may readily be realized, as the output of the shop depends upon prompt crane service.

To eliminate this trouble the electric hoist shown in Fig. 336 was designed. It consists of a drum, *W*, geared to a 5-h. p. electric motor, operated by the controller *A*. by which the load is raised or lowered by means of the ⅜-in. chain, one end of which is anchored at the extreme end of the girder, and passes back over the carriage pulleys *X*, *X*, and block *Y*, over pulley *Z* and down to drum *W*. The carriage is moved in or out on the girder by a ¼-in. chain connection with the reversible air motor *B*. This motor is geared to a pulley that carries

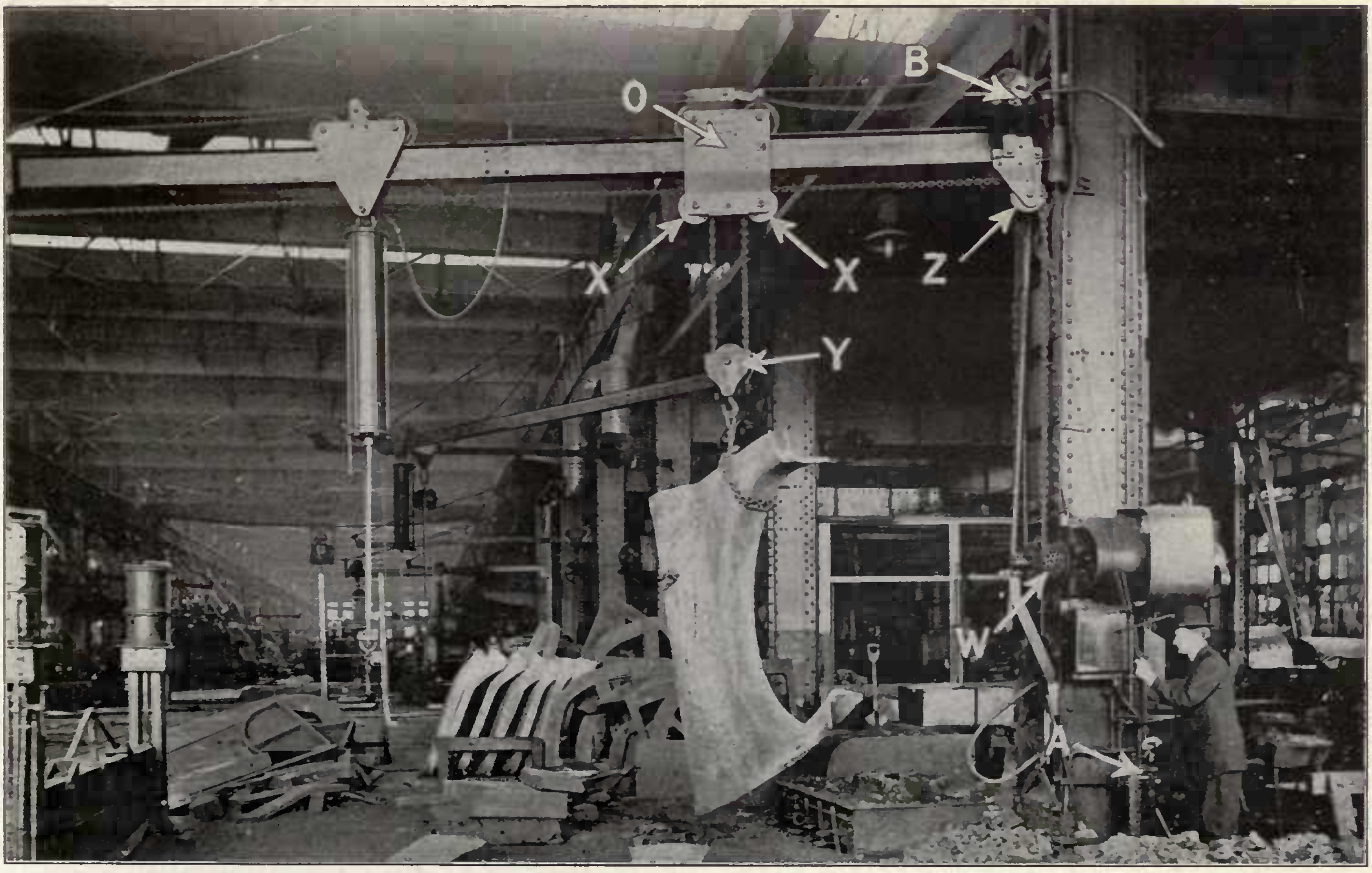



Fig. 336—Air-Electric Hoist Used in Connection with the Flanging of Boiler Sheets.

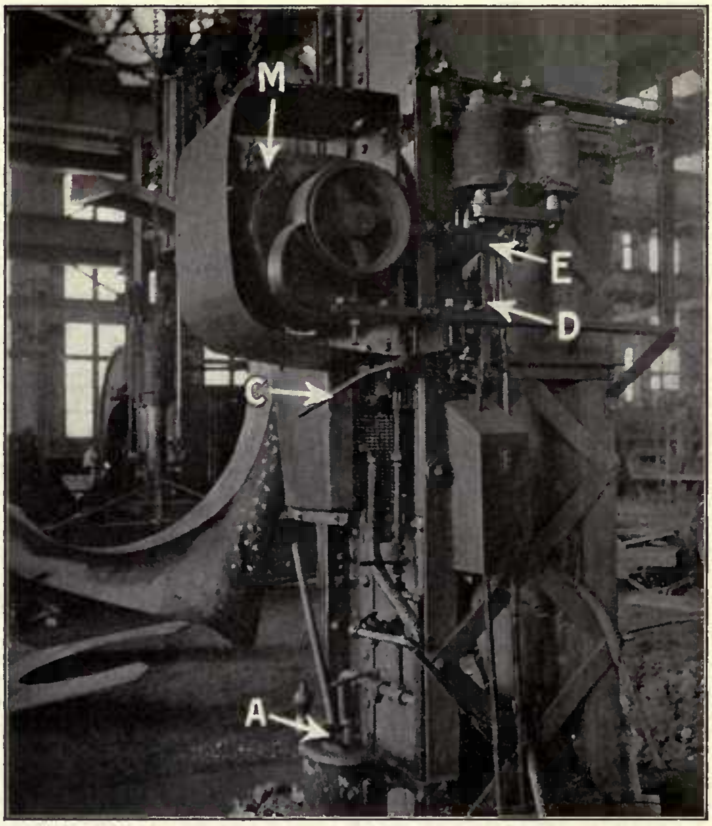



Fig. 337—Magnetic Brake for Electric Hoist.

the chain which is fastened to the carriage *O*, and passes over a pulley on the extreme end of the girder. A light chain is fastened to the reversing attachment on the motor and is dropped to a convenient height so that the operator may control the motor with his left hand, leaving the right one free to operate the controller *A*. In order that the load may be stopped and held at any desired height, a magnetic brake was devised, as shown in Fig. 337; this allows perfect control of the load at all times. The brake is applied instantly upon the current being shut off from the motor.—*H. G. Becker, Shop Demonstrator, Lehigh Valley, Sayre, Pa.*

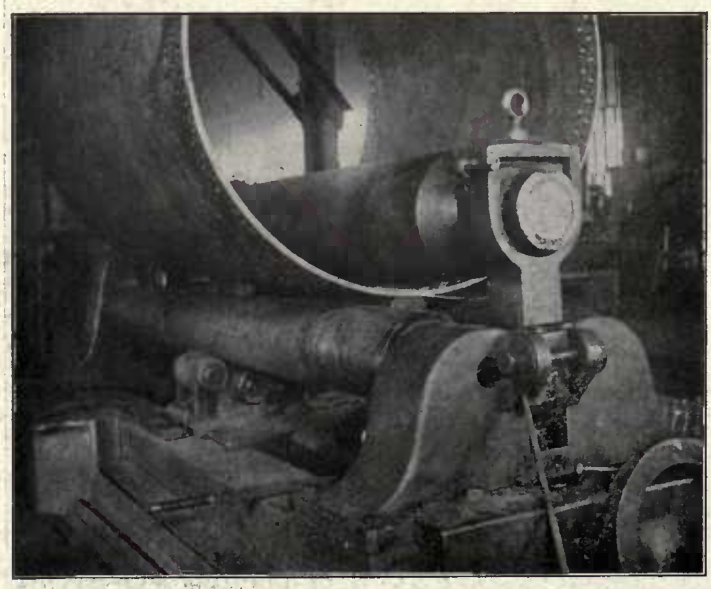


Fig. 338—Power Rolls for Flanging Conical Connection Sheet of Boiler Shell.

FLANGING, POWER ROLLS FOR.

A method of off-setting the flange of the conical connection sheet of boiler shells by the use of the power rolls instead of by the usual method of flanging by hand is shown in Fig. 338. A short piece of an old driving axle about 8 in. in diameter and 10 in. long is placed on the two lower rolls near the flange end of the sheet and another piece, smaller in diameter, is placed near the other end. The difference in the diameter of these pieces is made sufficient to flange out the end of the sheet for a short distance when it is desired to have a horizontal seam for the rivets. We believe this is entirely original with A. N. Lucas, the boilermaker at West Milwaukee, and have the impression that it is not used at other boiler shops. It requires three hours to flange this conical connection on the rolls, while the old method of flanging required about eight hours.—*Chicago, Milwaukee & St. Paul, West Milwaukee, Wis.*

HOLDER-ON, PNEUMATIC.

A pneumatic holder-on for use in driving rivets and staybolts is shown in Fig. 339. The cylinder is made from a 4-in. pipe, 10 in. long, and is provided with a piston, on the rod of which snaps can be adjusted, depending on the size and kind of rivet. The piston head is fitted with a leather gasket. A ½-in. air pipe is tapped through the back head and has suitable valves for regu-

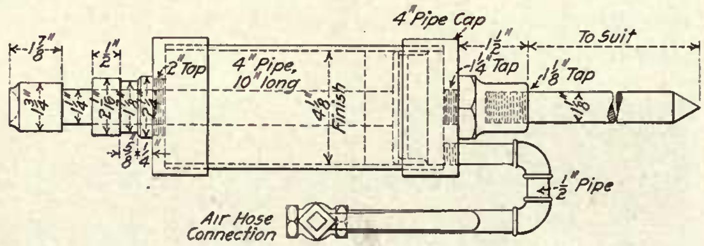



Fig. 339—Pneumatic Holder-On.

lating the air supply. The back head is provided with a socket for receiving centers of different lengths. The piston receives the impact of the air hammer through the rivet and compresses the air in the cylinder. This causes a reaction of the piston for each stroke of the hammer, and the tool serves the double purpose of holder-on and hammer.—*S. S. Lightfoot, Bonus Demonstrator, Atchison, Topeka & Santa Fe, San Bernardino, Cal.*

HOLDER-ON, PNEUMATIC.

A neat and effective contrivance for holding long-stroke hammers for overhead work is shown in Fig. 340. The weight of these hammers averages from 25 to 30 lbs. each, making it a hard job to hold them up. After completing one of these devices it proved so satisfactory that we made two more. Note the range that can be covered without changing position. We find this very useful for crown-bar bolts. Instead of hammering the bolts down with hand hammers, we have a shallow snap to fit the hammer, and work them down with the device shown. There is tension enough in the spring to hold the hammer and yoke up to the sheet. The operator swings the hammer around in a circle. The ball on the hammer allows the operator to work on an angle when circumstances require it. This device saves much hard work. —*D. P. Kellogg, Master Mechanic; W. E. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

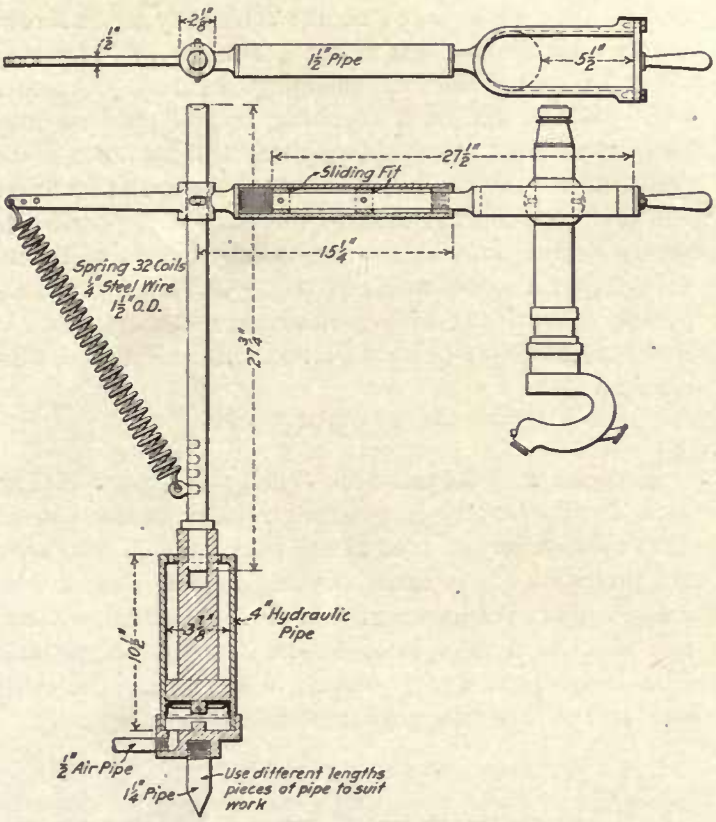



Fig. 340—Pneumatic Hammer Holder.

HOLDER-ON FOR TATE STAYBOLTS.

The regular Boyer holder-on, as designed for these bolts, is used, with the addition of a stirrup, Fig. 341, which passes around the holder-on, one end of which is rigid with it while the other end makes a loose fit over the collared bushing. This bushing is threaded for screwing on the staybolt in place of its cap. When air is admitted to the holder-on, the ball end of the plunger moves to a solid bearing on the round head of the bolt and forces the holder-on away from the bolt, resulting in a self-supporting holder-on against which the staybolt may be riveted over on the inside of the firebox in the usual manner. This work is handled by two men, one inside the boiler doing the riveting, while the man on the outside shifts the holder-on as the bolts are riveted. While riveting is going on, during which time he is not engaged in handling the holding device, he places the caps on the bolts.—*Central Railroad of New Jersey, Elizabethport, N. J.*

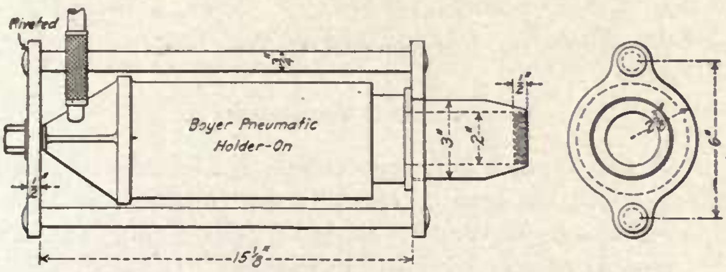



Fig. 341—Holder-On for Tate Staybolts.

MUD RINGS, REMOVING.

A method of using two heavy bars of iron, a round iron link and a jack for removing a mud ring is shown in Fig. 342. Although the rivets may all be removed the ring is far from being released, as it is held by the clamping action of the side sheets as well as by the rust and scale which has accumulated. Unless some continuous strain device, such as the one here shown, is used it is necessary to drive the ring down with hammer blows, but this usually results in damaging the corners of the ring and partially closing the rivet holes. After the rivets are removed and sections of the box are cut out at the corners, as shown, the lower 3-in. x 4-in. x 36-in. bar of iron is put in position, one end resting on the mud-ring and the other on a block of wood. A hydraulic or screw jack is then placed near the mud-ring end, and the top bar of iron with the downward extending arm is put in place, the hooked end gripping the sheet and the other end being run through the loop. The mud-ring may then easily be jacked down about 3/8-in., and when each corner is handled in a similar manner, the ring may easily be removed. The device is simple but effective.—*Central Railroad of New Jersey, Elizabethport, N. J.*

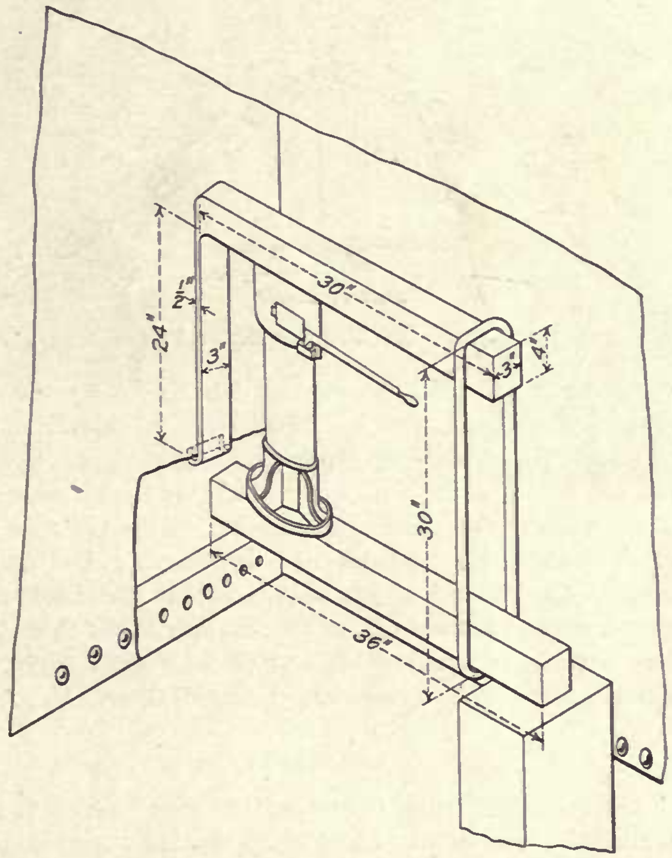


Fig. 342—Device for Removing Mud Rings.

OLD MAN.

The old man shown in Fig. 343 was designed by H. Weeks, a gang foreman at Elizabethport. It is intended particularly for work on boilers, but is applicable to equal advantage in other cases. The base is made of boiler plate, 1½ in. x 10 in. x 10 in. A side elevation of this base plate would show four feet formed by cutting out the center portion of metal in the vertical members. This provides for clearing rivets, etc. This old man is easily and quickly placed and by passing the chain around the boiler and catching a link in the hook the device may be fastened tightly by the use of the threaded bolt which has a swivel connection with the upright.—*Central Railroad of New Jersey, Elizabethport, N. J.*

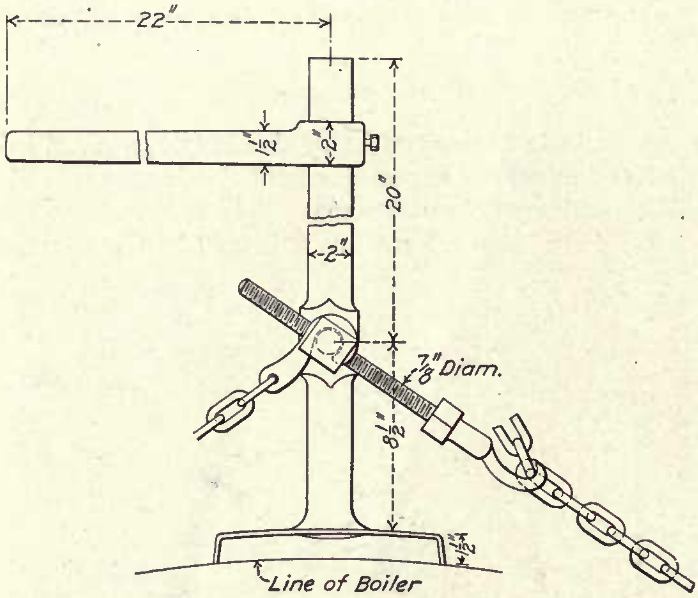



Fig. 343—Old Man for Boiler Work.

OLD MAN.

A serviceable drilling knee or "old man" which is intended for use in the boiler shop, but has been found useful in repairing steel cars and also in the locomotive erecting shop is shown in Fig. 344. The upright or support is made of 2-in. steel tubing or heavy pipe about 30 in. long with a rod running through the center; the knee or arm may be adjusted on the tubing by a set screw. When once the upright is set a number of holes may often be drilled without changing the base. Another good point is that on a rounding surface the base may be blocked with wood allowing the drilling knee to be set at almost any angle. By bending the rod at its lower end and blocking the base in this way it is possible to set the drilling knee at an exceptionally large angle from the position it would normally occupy. The device is especially useful in drilling mud ring corners.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

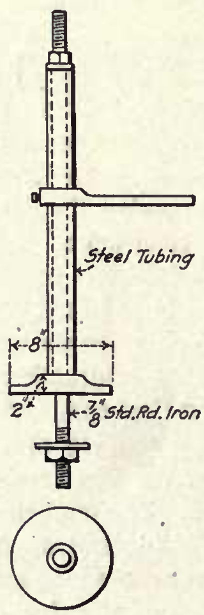



Fig. 344—Drilling Knee or Old Man.

OLD MAN.

A useful tool for staybolt drilling is shown in Fig. 345. It may be very successfully used in wide fireboxes. Two motors may be used at the same time, as two arms are provided. It is easily possible to drill over a wide range without readjusting the device. The shaft, made to suit any size firebox, is of 1¼-in. double strength pipe. The double point end is welded in the pipe. The other end screws into the pipe and when adjusted may be securely clamped by the use of a jam nut. Wrought iron arms are slipped on the shaft and secured by set screws. In the case of a locomotive which went into the roundhouse with 27 broken staybolts in the firebox, this old man was used and the bolts drilled out in an hour and 50 minutes.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

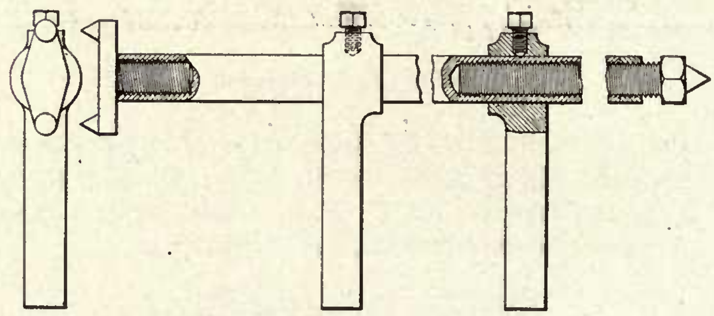


Fig. 345—Old Man for Boiler Shop.

PATCH BOLT COUNTERSINK.

A useful patch bolt counter-sink for boiler work, and one which has been successfully used in the New York, Susquehanna & Western shops at Stroudsburg, Pa., for a number of years is shown in Fig. 346. The stud, which acts as a guide, is screwed into the tapped hole in the boiler sheet. The cutter is then slipped over the stud and the counter-sink for the patch bolt is thus made square with the tapped hole. The cutters are forced into the sheet by tightening the winged nut. The cutter is driven by a ratchet wheel which fits over a square section of the countersink. Several different sizes of studs, to suit the various patch bolts, are carried in stock, such as 13/16-in., 7/8-in., 15/16-in. and 1-in. After using this tool the counter-sink of the patch bolt will make a perfect fit and will draw down square with the tapped hole. —*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

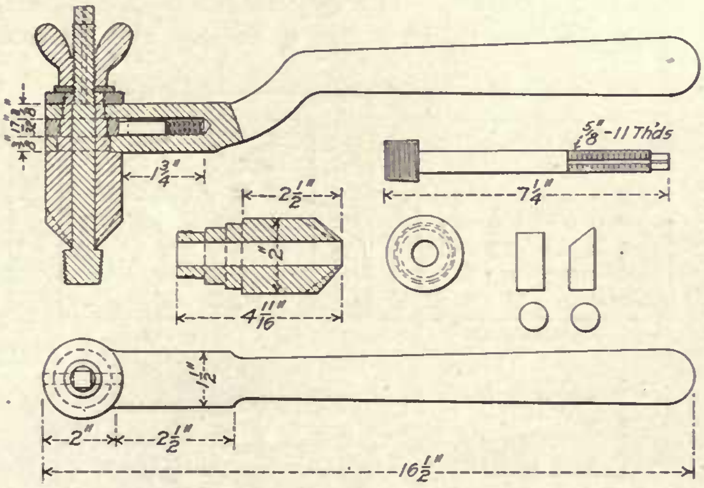


Fig. 346—Patch Bolt Counter-sink.

### PLATES, HOOK FOR HANDLING.

The hook for handling sheet metal, shown in Fig. 347, is primarily a safety device, although it is a decided time-saver when it is necessary to fasten the sheet firmly to the supports when punching or shearing. The eccentric action of the hook plate gives a firm hold on the sheet and is instantly released when the weight of the sheet is taken off the crane chains.—*F. S. Robbins, Inspector, Pennsylvania Railroad, Renova, Pa.*

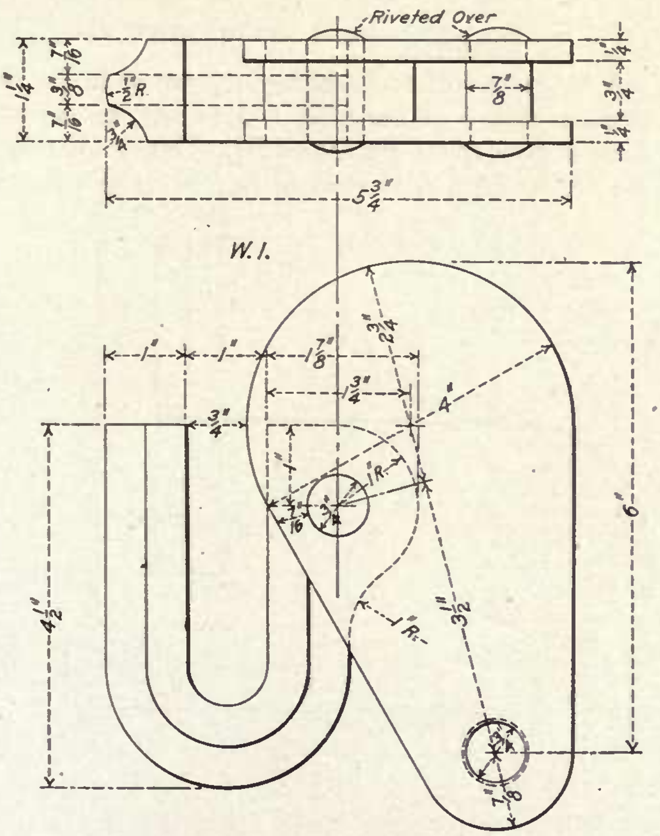



Fig. 347—Hook for Handling Sheet Metal.

### RIVET FORGE, PORTABLE.

A handy, portable rivet forge, used in the erecting shop, is shown in Fig. 348. The hood is made of light sheet iron and rests on a framework, having three cast iron wheels, the small one being a guiding wheel. Coal is carried in the box and air pressure is supplied from the shop air line.—*Lehigh Valley, Sayre, Pa.*

Fig. 348—Portable Rivet Forge.

### RIVET FORGE, PORTABLE.

An efficient design of portable oil rivet forge is shown in Fig. 349. The frame work is made of sheet steel and

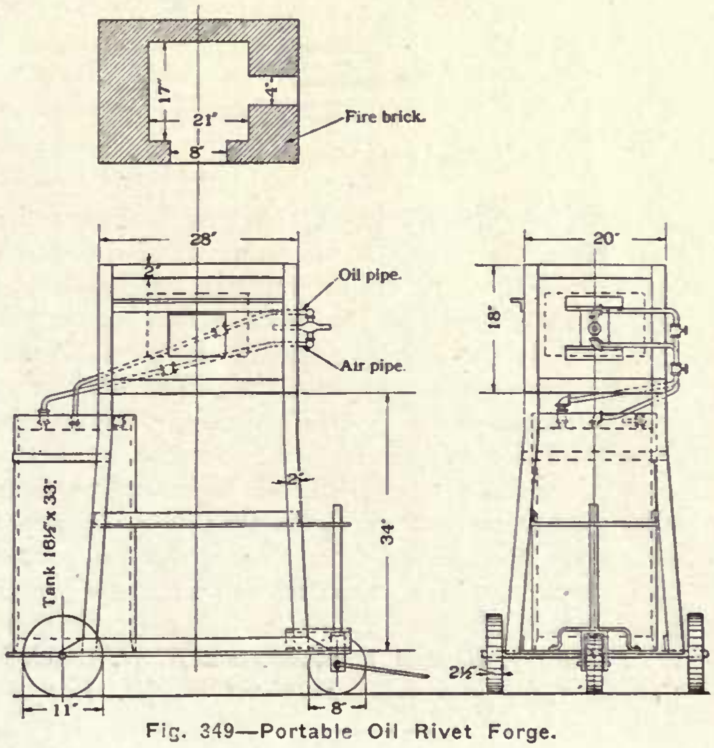



Fig. 349—Portable Oil Rivet Forge.

angle iron and is mounted on three wheels, the leading one of which swivels and carries a tongue for hauling the forge about the shop. A tank, 16½ in. in diameter and 33 in. high, is mounted at the rear for storing the crude oil. The oil is forced to the burner by air pressure, and the oil and air are mixed at the burner in proper proportions for complete combustion. The interior of the furnace is 17 in. wide by 21 in. long, has an 8-in. opening and is lined with fire brick. An intense heat can be obtained in a short time, and provision is made for close regulation. This forge will heat rivets for several gangs at the same time.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

RIVETER, YOKE.

While a yoke riveter is not a new thing, the way we use the one shown in Fig 350 in the boiler shop is of interest. After the staybolts are all broken down with the staybolt breaker, the firebox is taken out, the backhead,

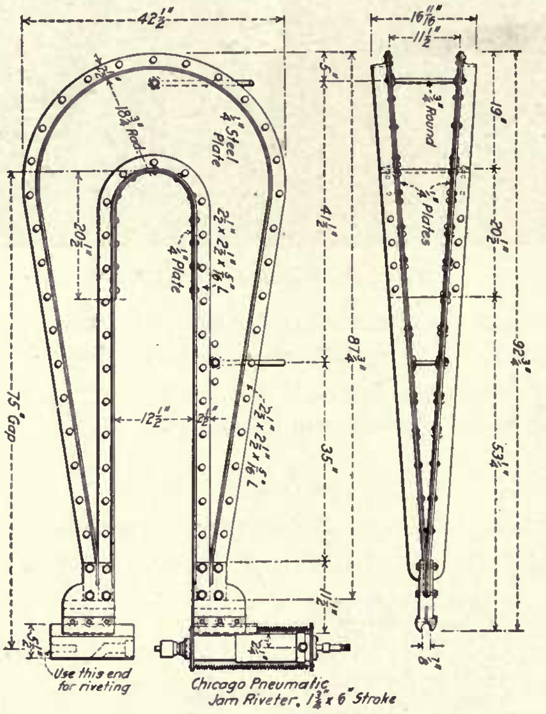



**Fig. 350—Yoke Riveter.**

of course, being taken off first. Then we have the broken bolts left in the outside of the sheet. It used to be the custom to drill or split the bolts with an air hammer, but we found this slow work; hence the reason for the yoke riveter. A jam riveter is applied as shown. We have a portable crane that can be transferred to any part of the shop by means of a large electric crane. This portable crane holds the yoke riveter in any position we want to work in. We take a radial staybolt boiler and knock out every piece of staybolt left in the sheet by the breaker in nine hours, working one man only. This job used to take one man six days. The device thus paid for itself in a very short time.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

RUNNING BOARDS, STAMPING STEEL.

A special set of dies for stamping the projections on steel running boards, or steps, to prevent slipping, is shown in Fig. 351. The dies are made of mild steel blocks, 15 in. x 19 in. x 2½ in. in size, and are fitted

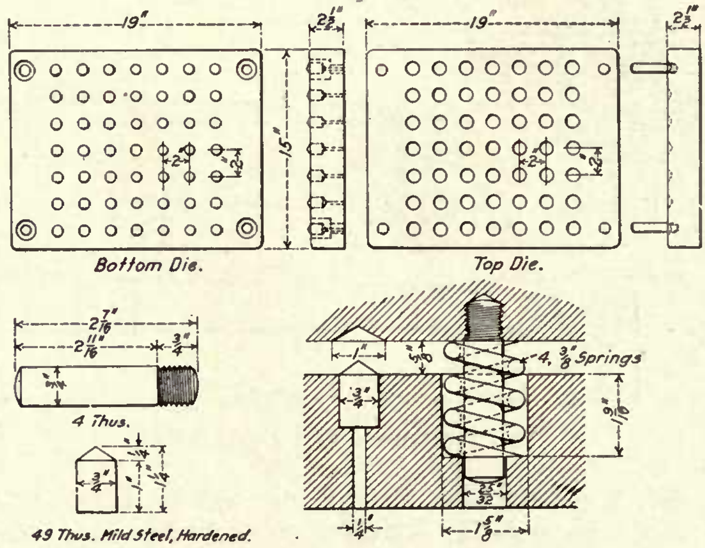



**Fig. 351—Dies for Stamping Steel Running Boards and Steps.**

with forty-nine ¾-in. pins, as shown. The four springs, one at each corner, raise the top die after the sheet is stamped. The dies are used in a hydraulic sectional flanger.—*Rock Island Lines, Silvis, Ill.*

SHEARS, FLANGING ATTACHMENT FOR.

A useful device for flanging light work in the boiler shop, as shown in Fig. 352, is applicable to any heavy shear in place of the regular blades. This tool has flanged 444 ft. of ¼-in. tank steel in two hours and five min-

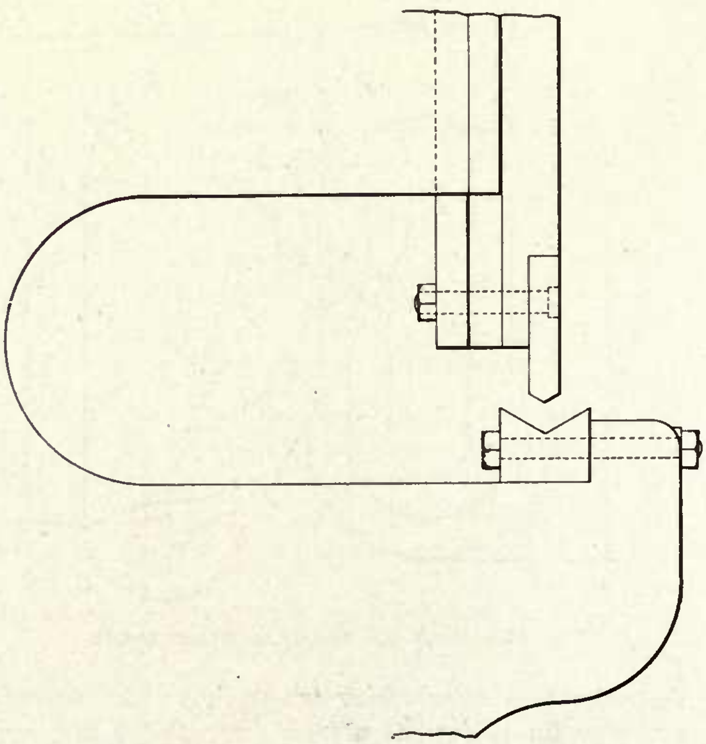


**Fig. 352—Flanging Attachment for Shears.**

utes. It may be made to flange at any angle, working metal up to 7/16 in. thick. It is made of hardened tool steel and may be adjusted to suit any angle or thickness of plate by slipping liners under the lower former. This tool was used on 146 drop-bottom ash pans, requiring flanges top and bottom the full length of the pan. This work was done with a saving of $4.85 on each pan. It has also been used in flanging several straight crown sheets and a large amount of car work. The work flanged with this tool is all handled cold.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

SCARFING HAMMER.

A pneumatic scarfing hammer for making tube ferrules is shown in Fig. 353. Previous to having this machine the work was done by the use of a hammer, anvil and tool. Strips of galvanized iron were cut of a width equal to the circumference of the tube hole and about 24 in.

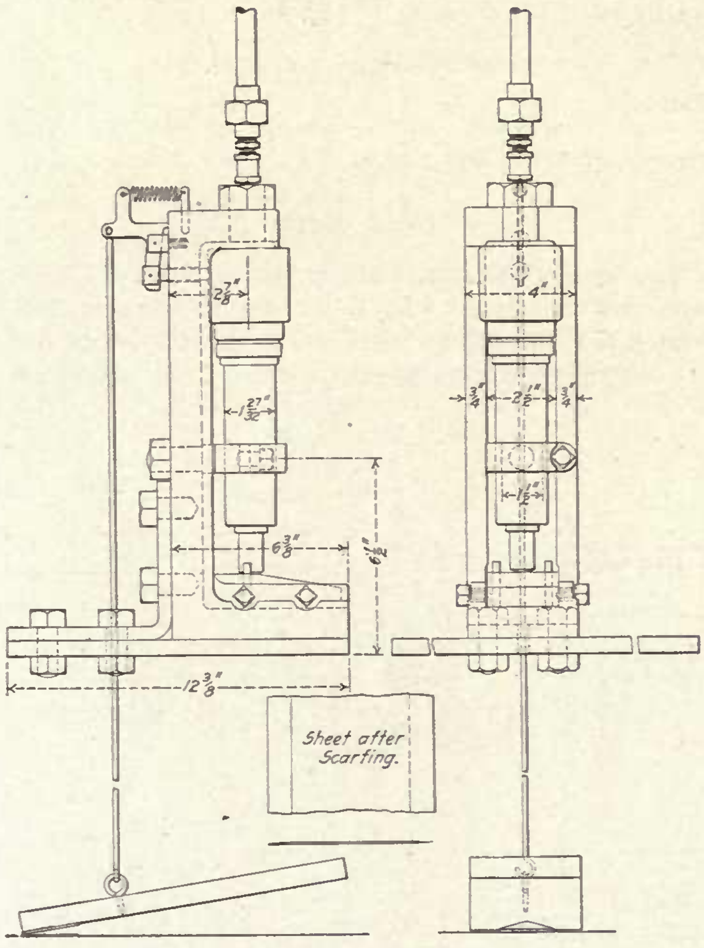



Fig. 353—Pneumatic Scarfing Hammer.

long, and the edges were then hammered down by hand, after which the strips were cut into widths to suit the tube sheet. With the pneumatic hammer, which is bolted to a substantial bench, the strips are cut as mentioned above, but are fed through the hammer at a very rapid rate. The air is controlled by a foot treadle.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

STAYBOLT BREAKER.

At first glance, one would say that the staybolt breaker shown in Figs. 354 and 355 was too large and heavy, but as it is intended to be handled by a crane and suspended on chains when being used, its weight is of no great moment. This breaker differs from the general run of such tools, which remove the staybolts by striking a blow, as

Fig. 354—Application of Staybolt Breaker.

it breaks the bolts by exerting a pulling strain until the metal shears. The pulling rod, shown in the upper left hand corner of the sketch, is made in several lengths, including 4 ft., 6 ft., 9 ft., 12 ft. and 15 ft., and is made in rights and lefts. The main part of the puller rod is made of wrought iron with a tool steel end welded on, which latter forms the hook for taking hold of the bolts. The rough wrought iron sleeve slides on the puller rod. With the wrought iron steel pin, this sleeve is quickly made fast at any desired point along the rod, and the pull is effected by the fork-shaped end of the lever bearing against the sides of this sleeve.

In using, the breaker assumes about the position shown in photograph. The rod is then run through the fork at the end of the lever and the hook is placed over a stay bolt. The sleeve and pin are then slipped into position and air is admitted to the cylinder. When used on the short bolts in the water leg, the hook is placed at about the middle of the bolt, which bends a little and then shears off at both sheets. In the case of the long radial stays, however, the hook is placed as near as possible to the outside sheet and the bolt shears at this sheet only. The bolt, therefore, remains in the firebox sheet, but as the box is to be removed and usually scrapped, this makes no difference. The ends of the bolts remain as plugs in the holes of the outside sheets, but these are easily knocked out afterward. It will be noted on the drawing that the ⅞-in. eye bolts, by which the breaker is handled, are cast in, making them permanent with no danger of loosening due to the heavy strains which come on them. The wrought iron lever fits loosely in the end of the piston rod. The breaker is made for using on either side of the boiler, it being only necessary to remove the fulcrum bolt and shift the lever to the other side. The air-controlling valve, shown in the photograph, is a three-way valve, moving 60 deg. on either side of the central or lap position. These two extreme positions open communication with opposite ends of the cylinder. With this breaker, a box having 1,800 bolts may be cut out in 14 hours.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

STAYBOLT BREAKER.

The staybolt breaker, shown in Fig. 356, does not differ greatly from other breakers of this general design. The barrel is made of steel tubing, 4-in. inside diameter. The ram or plunger is 12 in. long and is made loose running in the cylinder bore. The ¼-in. thick packing leathers are used with the flanges turned in opposite directions. These leathers are held between two thick washers, 3 in. in diameter and 5/16 in. thick, the whole being held in position on the back head of the plunger by a ¾-in. tap bolt. The hammer end is 9 in. long over all, and is screwed to the barrel by a spanner wrench. In using, the breaker is swung in position, a block and fall being used to hold it against the chisel. After a blow, the handle of the 3-way cock is drawn back to the position shown. When the valve is first moved, air enters the forward end of the cylinder to return the plunger preparatory for another blow. The backward movement of the valve handle also causes a collar to move backward and expose eight ½-in. drilled holes which release the air in the front end of the cylinder, while that at the rear end exhausts

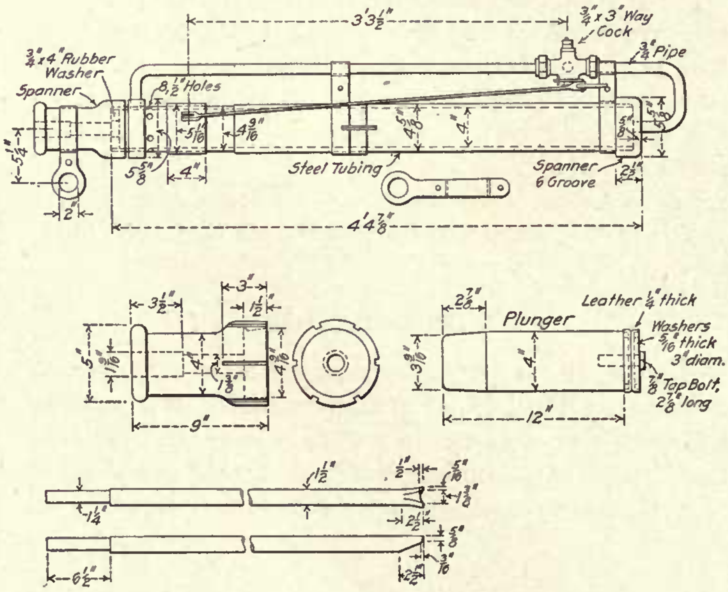



**Fig. 356—Staybolt Breaker.**

through the 3-way valve.—*Central Railroad of New Jersey, Elizabethport, N. J.*

STAYBOLT BREAKER.

The air hammer, shown in Fig. 357, is made of 2½-in. pipe, and was designed by E. C. Schoen, Chicago, Burlington & Quincy shops, St. Joseph, Mo. It is intended for cutting rivets up to ¾ in. in diameter. By actual test

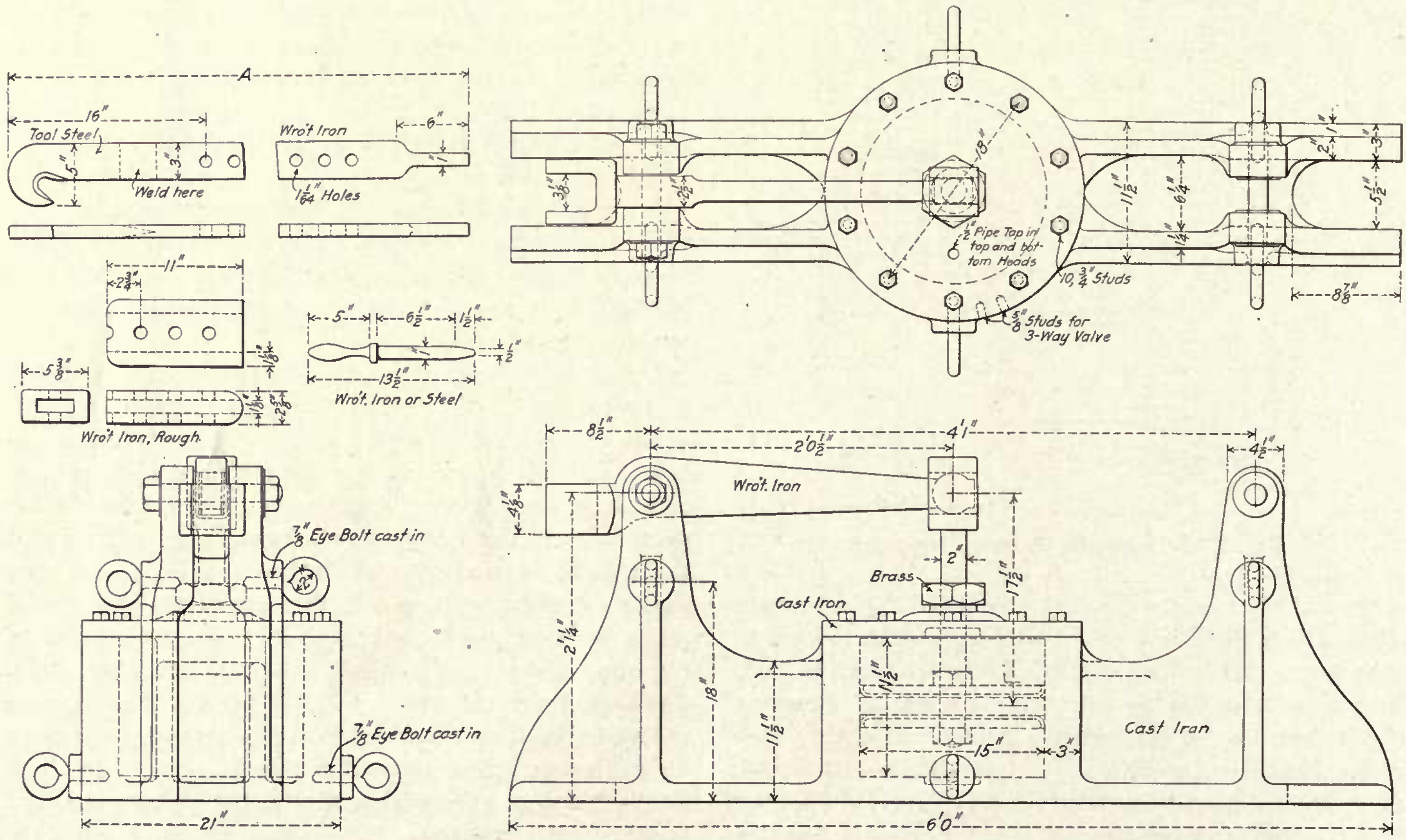



**Fig. 355—Staybolt Breaker.**

it will cut ¾-in. rivets with six strokes and ½-in. rivets with one or two strokes. It is operated by a push button valve which controls the delivery of the blow; the piston into the valve and to the atmosphere through the exhaust holes *H*.—*John Howe, Draftsman, Chicago, Burlington & Quincy, St. Joseph, Mo.*

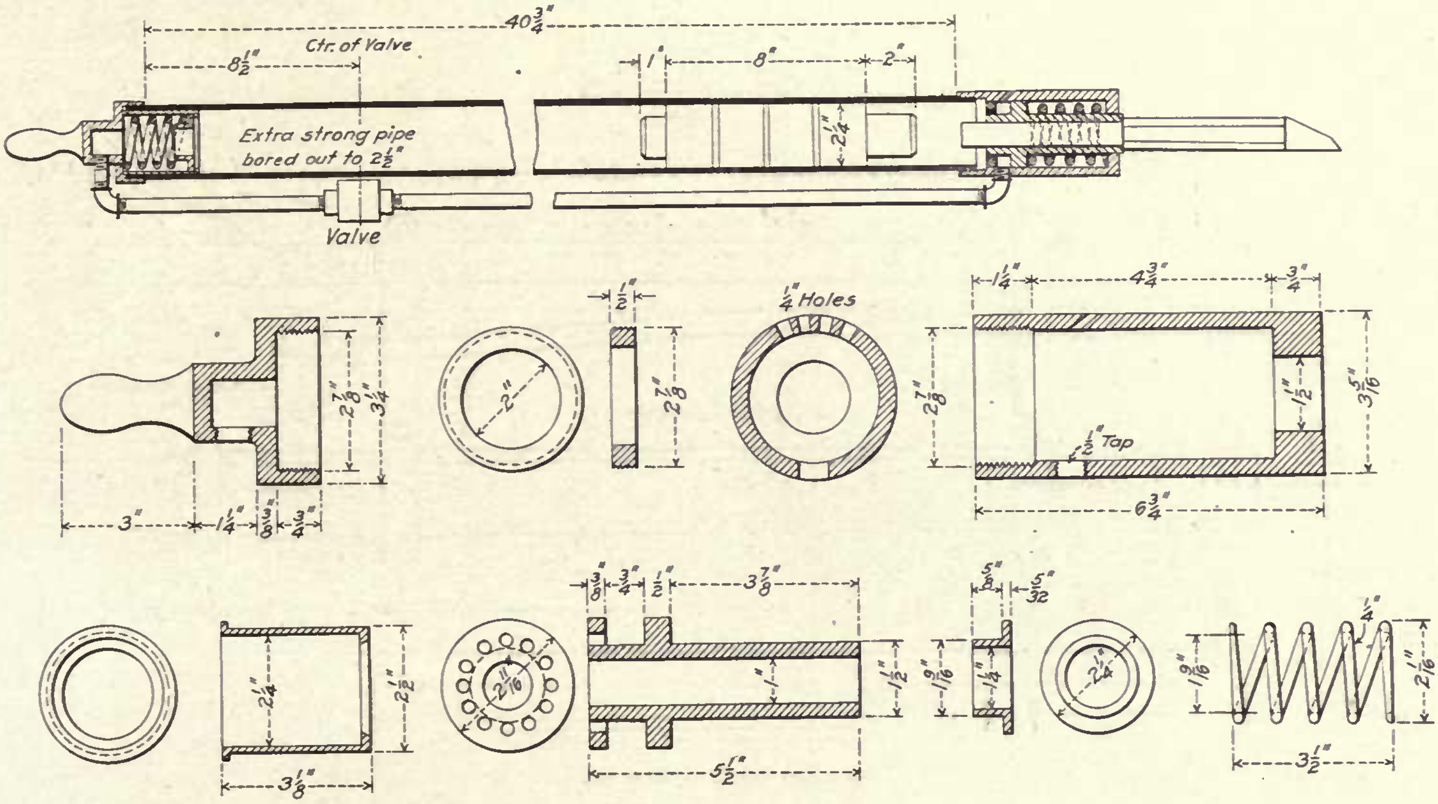



Fig. 357—Long Stroke Air Hammer.

returns automatically. Section *AB* (Fig. 358) shows the valve in the position for returning the piston to the back end of the hammer; the live air passes in the inlet *E* and through the 1/32 in. space at the top of the piston valve and the outlet *F* to the front end of the hammer. The exhaust air passes through the outlet *G* into the atmosphere at *M*: the coil spring holding the valve in this position. For the driving stroke the operator pushes down the valve and air enters the inlet *E* and passes through the outlet *G* into the back end of the hammer, driving the piston forward. The exhaust passes through the outlet *F*

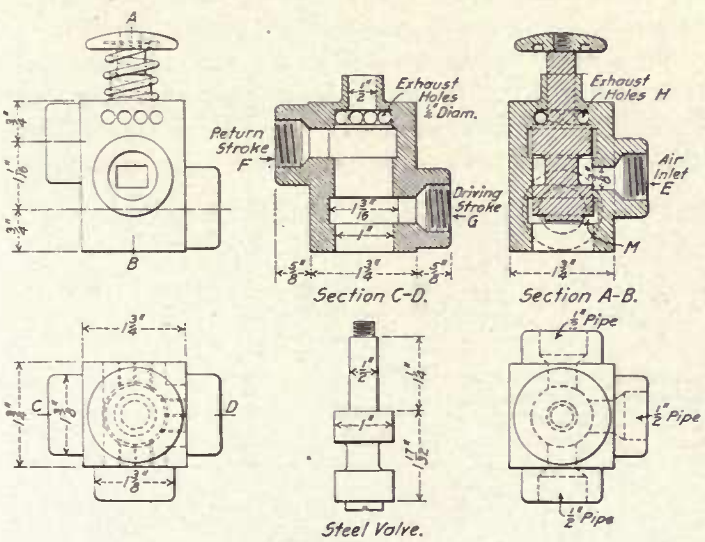



Fig. 358—Automatic Valve for Long Stroke Air Hammer.

STAYBOLT BREAKER.

The staybolt breaker in Fig. 359 is shown, not to illustrate the ram action which corresponds very closely to that of other breakers, but to emphasize a feature not found in the others. The metal framework forms a carriage, or double A-frame, which is mounted on four small wheels. The ram is elevated and lowered by a block and fall fastened to the top cross arm connecting the two A-frames. Suspended below the ram cylinder, is an air cylinder, the piston of which is supplied with a hook. This arrangement provides for holding the breaker

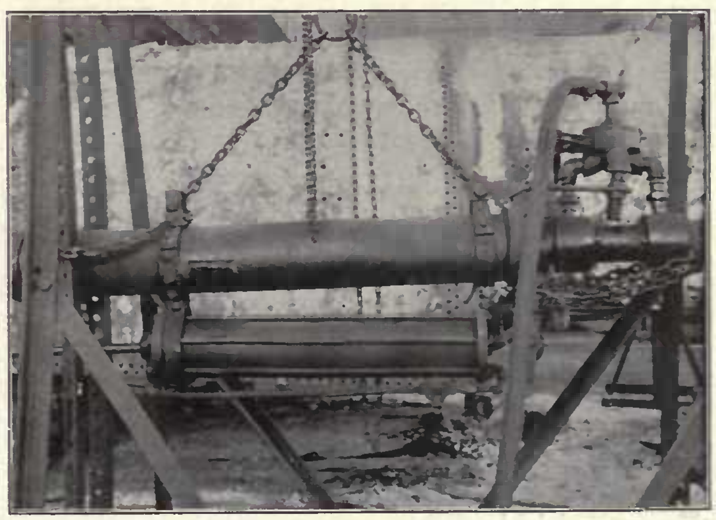


Fig. 359—Staybolt Breaker.

ram against the staybolt and for moving the carriage on after a bolt is broken. One man stands upon a platform on the carriage and operates the two air valves, one of which controls the carriage while the other applies air for the ram.—*Lehigh Valley, Sayre, Pa.*

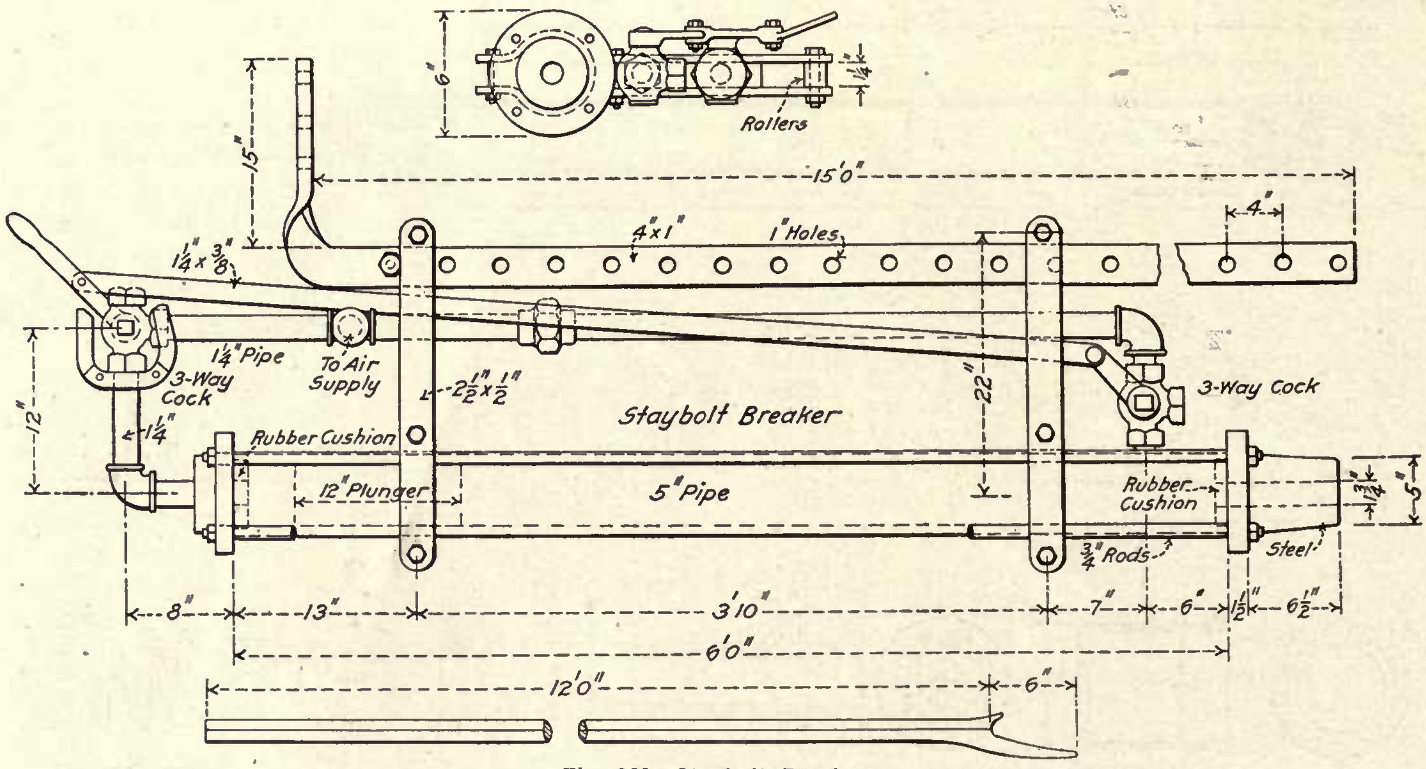


Fig. 360—Staybolt Breaker.

### STAYBOLT BREAKER.

The staybolt breaker, shown in Fig. 360, will break three 1-in. staybolts at a single stroke. It consists of a 5-in. pipe, into which a 12-in. plunger is fitted. The two ends of the pipe are connected by 1¼-in. piping with a three-way cock, to the handle of which a connection reaches to a second three-way cock near the other end of the cylinder. The device is suspended outside the water leg, and the chisel with a 12-ft. stem, is inserted at the end. The hook or chisel end is placed against the staybolt and air is admitted to the back end of the cylinder, which throws the plunger violently forward. The blow of the plunger is cushioned by the air and a rubber pad placed at the delivering end of the 5-in. pipe.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

### STAYBOLT CUTTER TAPER ATTACHMENT.

An attachment applied to an Acme staybolt cutter for cutting taper threads on crown or radial staybolts is shown in detail in Fig. 361 and as it is applied to the machine in Fig. 362. It was designed as a shop kink, but it proved so valuable, especially where there was a large number of taper bolts to be cut, that it was patented by

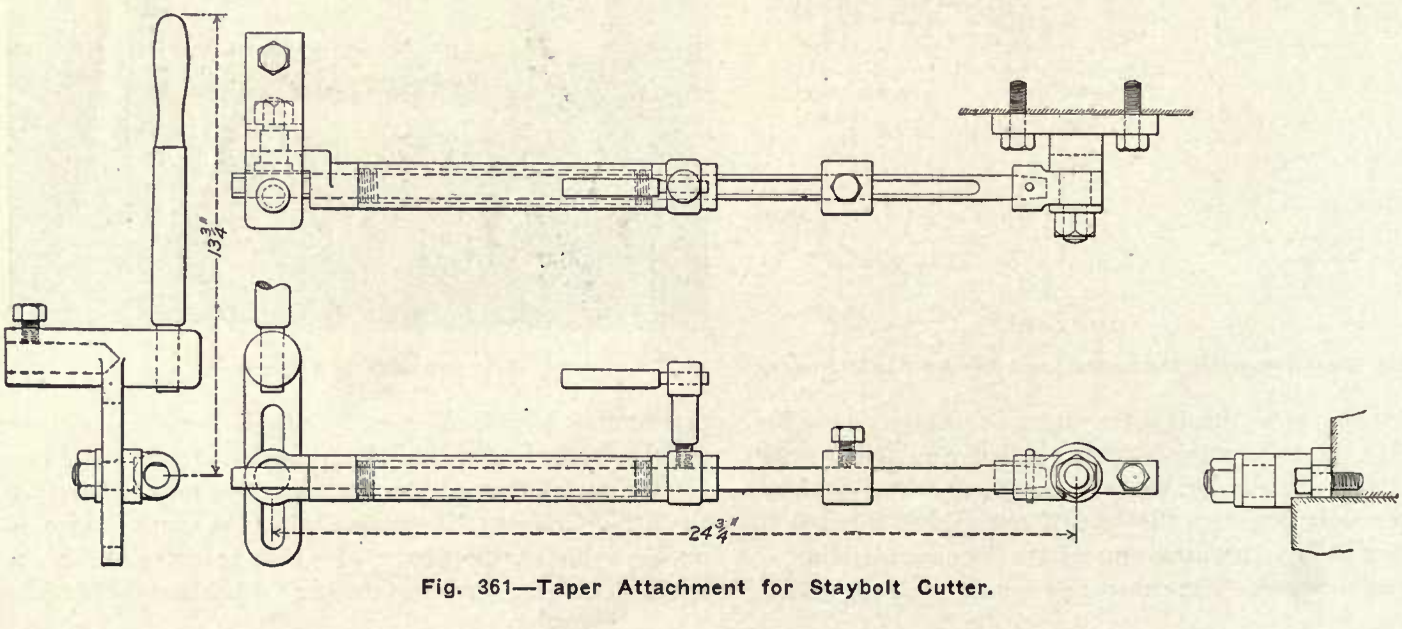


Fig. 361—Taper Attachment for Staybolt Cutter.

H. Neville, tool room foreman of the Southern Pacific at Los Angeles, Cal., and is now being handled by the Acme Machinery Co., Cleveland, Ohio. The device confines the work on the bolts to one machine, where they are finished with both straight and taper threads.

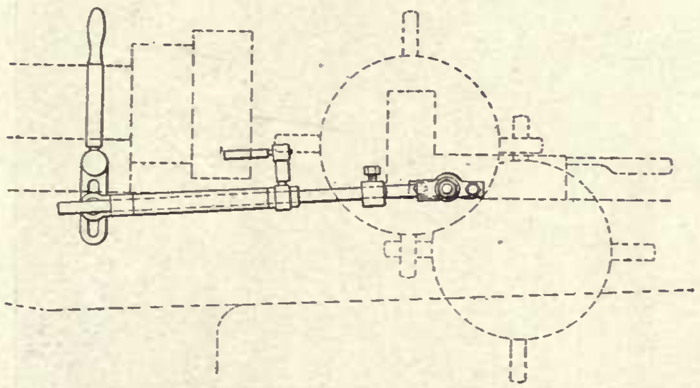


**Fig. 362—Taper Attachment in Position.**

Previous to having this attachment, two machines were used for the work. By the use of this attachment the cost of cutting threads on staybolts has been reduced 60 per cent. A novel feature is that it can be adjusted to cut any taper from ½-in. to 2-in. in 12-in. It can be operated automatically and may be adapted to other machines in cutting both brass and iron.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

STAYBOLT BREAKER.

A pneumatic staybolt breaker is shown in Fig. 363. It is a rather highly-developed design. The cross section shows the arrangement of the live air and the exhaust valves, and the 16-in. x 3¼-in. machinery steel ram, which has a packing ring at either end and a 2-in. x 4-in. piece of hard steel in the striking end. The ⅞-in. x 2⅜-in. x 14-ft. 3-in. long track on which the breaker runs is bolted fast to the firebox. One man operates the cam which locks the breaker in position, and also the air valve. A second man places the breaker bar end on the staybolts. —*Long Island Railroad, Morris Park, N. Y.*

STAYBOLT TELL-TALE HOLES, DRILLING.

A breast drill with an attachment for spraying water on the drill in drilling detector holes in staybolts is shown

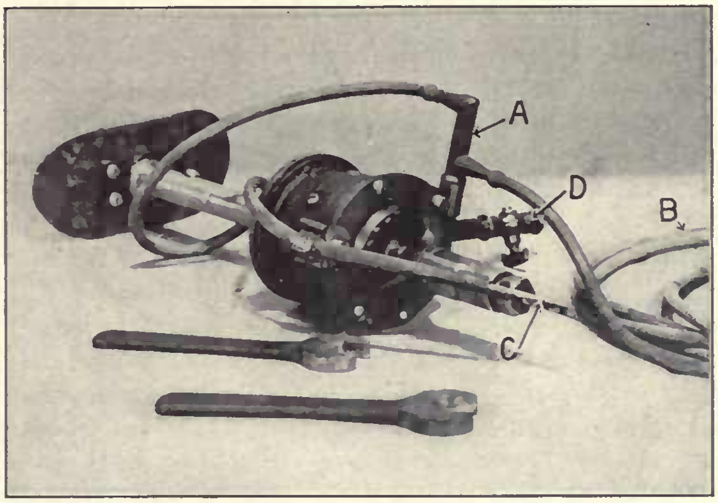



**Fig. 364—Water Attachment for Breast Drill.**

in Fig. 364. The rubber tubing *B* is placed in a water tank. The water is siphoned from the tank through this

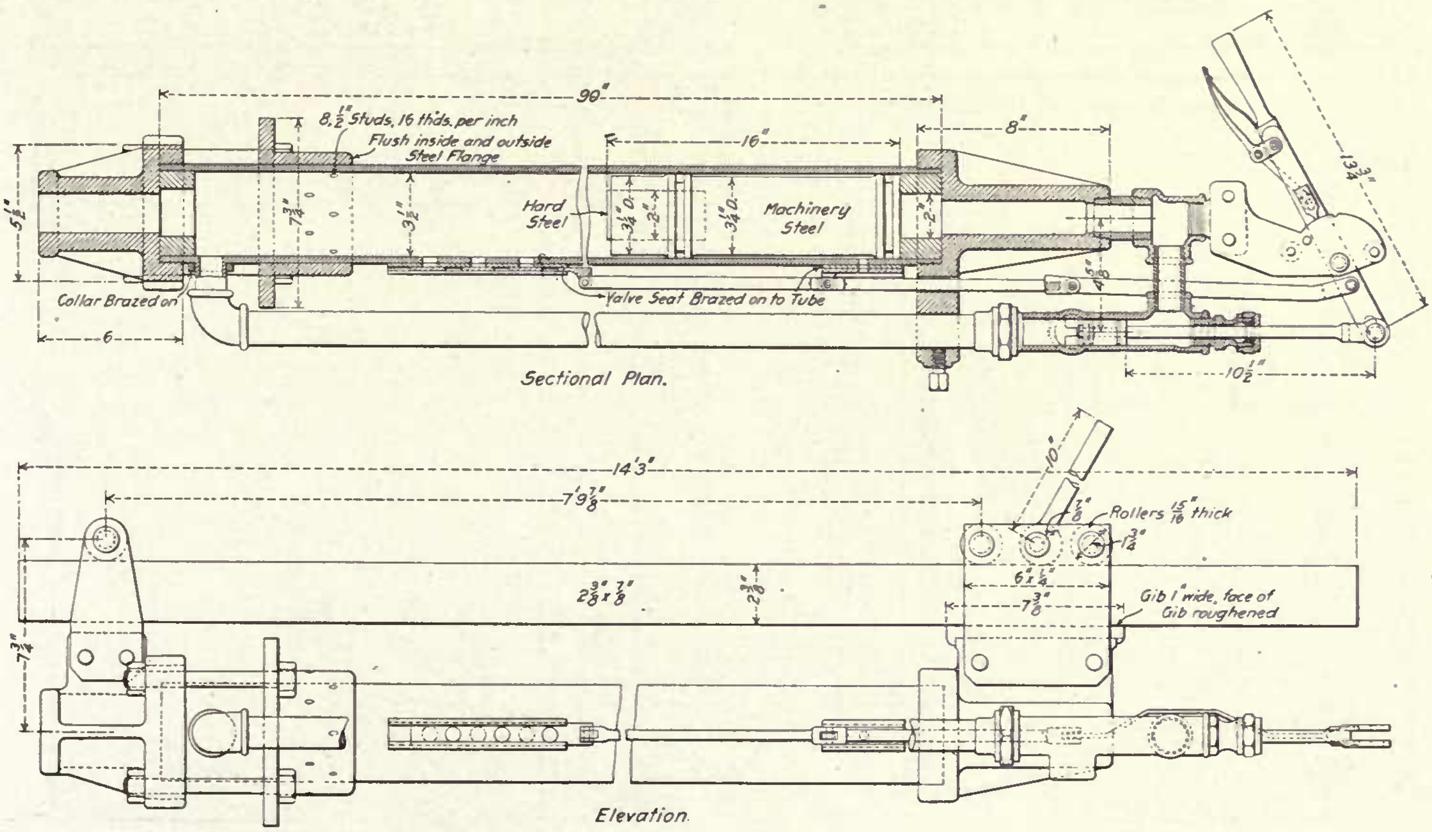



**Fig. 363—Staybolt Breaker.**

tube, the part *A* and out through the nozzle *C*. The air for operating the drill enters the motor through *D*. Some of it goes through the pipe *A*, rushing across the end of the tube *B*, thus causing a partial vacuum in *B* and siphoning the water through it.—*Chicago & North Western, Chicago.*

STAYBOLT DRILL, MULTIPLE.

A multiple staybolt drill in use at the Dale Street shops of the Great Northern at St. Paul, Minn., is shown in Figs. 365, 366 and 367. It was designed and built at these shops and is, so far as we know, the most elaborate device of the sort in use in any shop in the country. It has a total of 11 drills—three on each side and on top, and two at the back—and is operated by four men. One of the side drills was removed at the time the photograph was taken. The saving in time possible with this number of drills and men, all working together, is obvious, the staybolts in a boiler now being drilled out in one-fourth the time possible by any method previously used in these shops.

As appears from the illustrations, the frame is formed of 5-in. pipe columns and 8-in. double channel transverse top members, with latticed diagonal braces. The frame is 13 ft. 2⅛ in. x 15 ft. 9 in. on column centres, and the pipe columns are 16 ft. 4⅝ in. long. The top set of drills is carried on a rail, supported by a double-channel frame, the side members of which are secured to heads surrounding and sliding vertically on the main frame columns. This drill frame is raised and lowered by means of four power-driven screws mounted on the frame columns and about half the length of the columns. The side and end drill carriages are mounted on vertical guide bars, 2½ in. x 7 in., upon which they slide, being moved

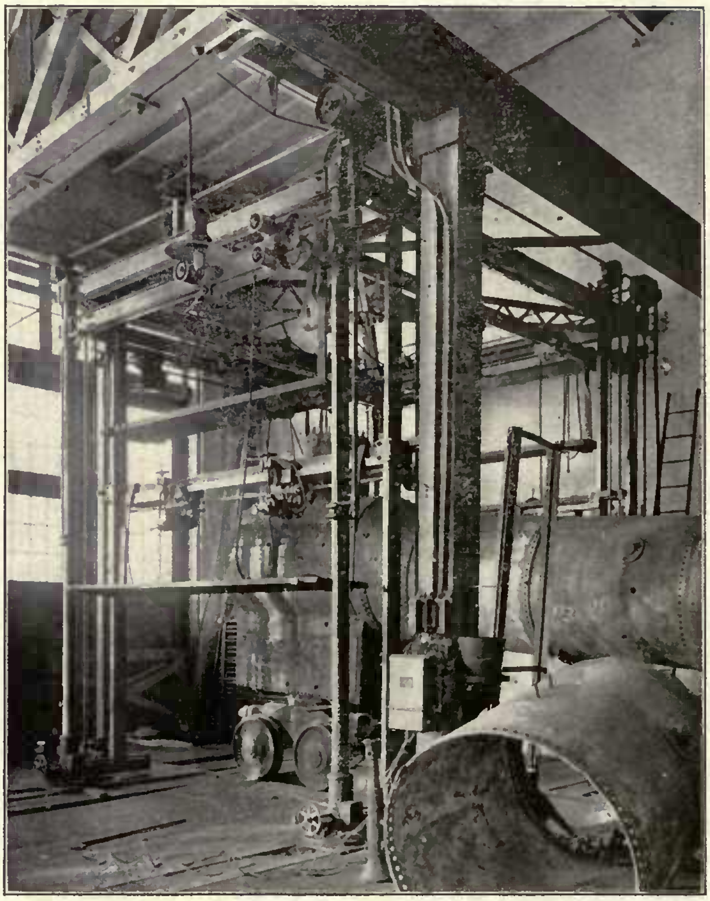


Fig. 365—Multiple Staybolt Drill.

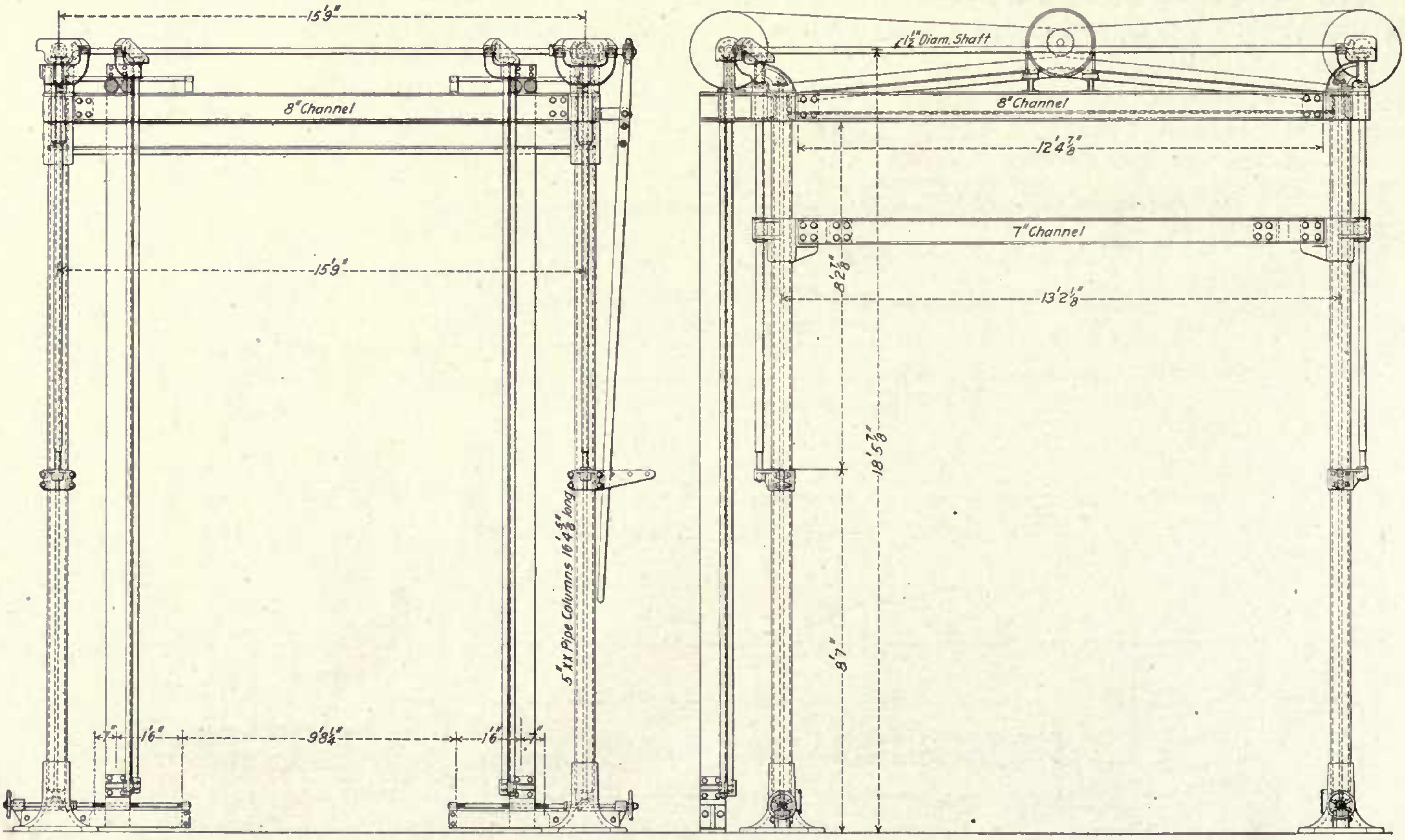



Fig. 366—Side and End Elevation of Multiple Staybolt Drill.

by a power-driven worm mechanism, as indicated in the carriage details, Fig. 367. The side bars are adjustable laterally for different widths of fireboxes, by top and bottom adjusting screws. This adjustment is secured by a hand-wheel on the bottom screw, a vertical shaft inside the column, and bevel gearing, imparting the motion to the top screw. At the top the guide bar travels between the two frame channels and is carried on four small wheels, a pair rolling on each channel.

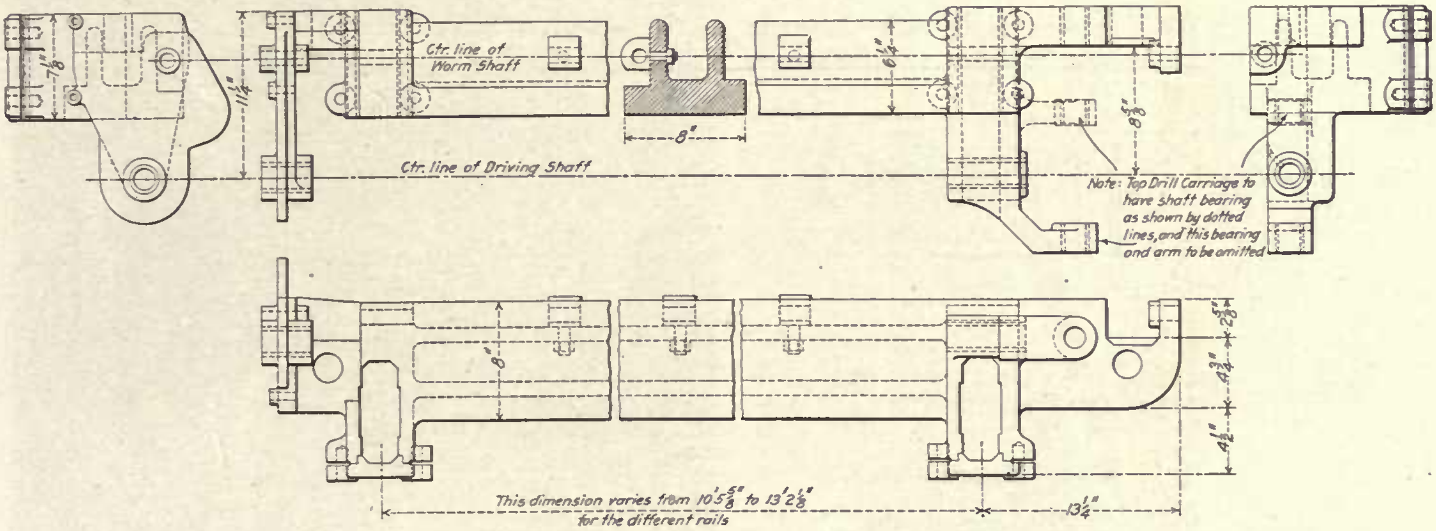



**Fig. 367—Drill-Head and Carriage Details of Multiple Staybolt Drill.**

Details of the drill carriage are included in the drawings. As will be seen from these and the photograph, the drills are driven from a horizontal shaft under the carriage, which is driven by bevel gearing from a vertical shaft at one end. The drill is adjusted to drill at different angles by a centering screw between the head and the stock, plainly shown in the photograph. The drill is fed by air pressure, the hose connections to the small 4-in. x 4-in. air cylinder on the back of each drill stock being for this purpose. Power for the machine is furnished by a 10 h.p., a. c. motor, running at 865 r.p.m. under load.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

STAYBOLT TELL-TALE HOLES, DRILLING.

A handy machine for drilling tell-tale holes in staybolts is illustrated in Fig. 368. By applying an air cylinder to the end of a small motor and admitting air after it has been placed ready to drill a hole, it acts as an air feed and keeps the drill in line. The old method of drilling tell-tale holes was a hard job, because the operator had to push the drill in 1¼ in. on each staybolt, and a little movement either way when the drill was in the bolt would break it. Any man who has had to drill staybolts in the boiler will concur in this statement. Our method of drilling holes with this machine is very simple. Use two high horses, and tie with pieces of wire from some convenient place at the top of the horses to the boiler. Then set a board perpendicular, and it can be moved along the line of bolts to be drilled. The operator can sit down and drill a staybolt in 20 seconds. Our cost of drills has been reduced 50 per cent. and labor reduced 40 per cent., besides making it easier for the driller.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

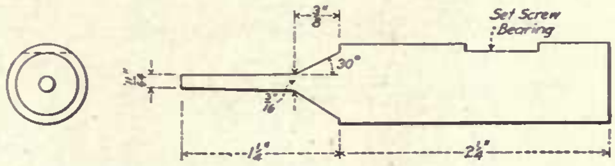



**Fig. 369—Punch for Staybolt Tell-Tale Holes.**

STAYBOLT TELL-TALE HOLES, PUNCH FOR.

A punch used in a bolt heading machine for punching and countersinking tell-tale holes 1¼ in. deep in staybolts at one operation is shown in Fig. 369. The body of the punch may be made any size to suit the machine; a

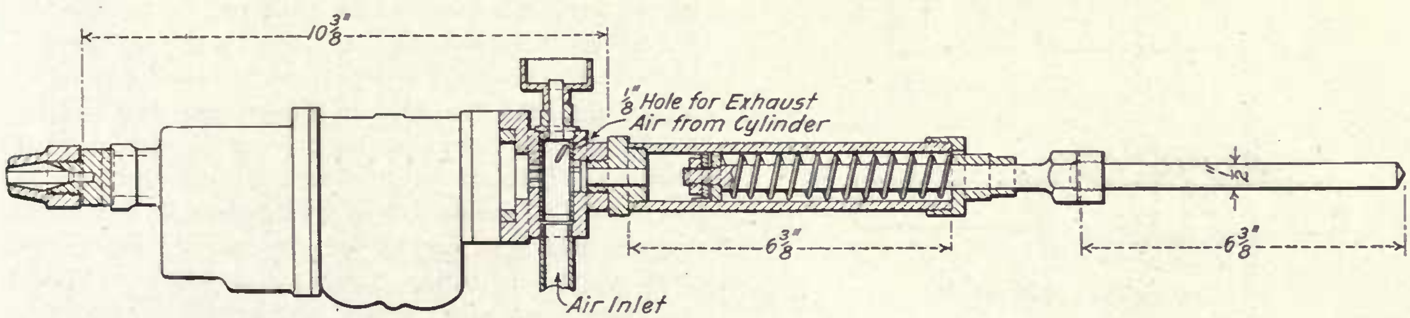



**Fig. 368—Pneumatic Attachment for Feeding Air Motor in Drilling Staybolts.**

tool of this kind will punch from 2,000 to 4,000 bolts without bending or breaking. It should be made of tool steel and in tempering care should be taken not to make it too hard. If tempered to a light blue it will give the best results.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

### STAYBOLTS, APPLYING FLEXIBLE.

A device for applying flexible staybolts is shown in Figs. 370 and 371. It consists of a sleeve *A* which screws

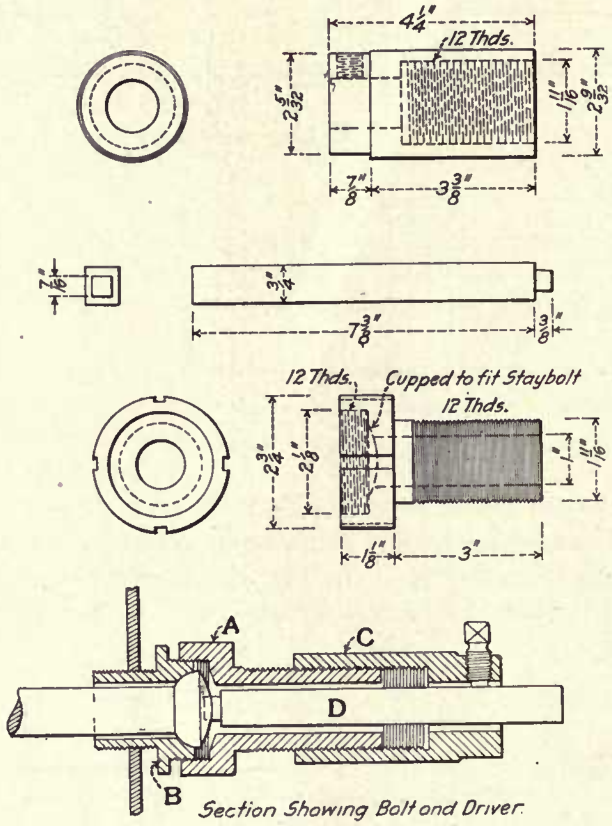



Fig. 370—Driver for Flexible Staybolts.

on the socket *B*. The sleeve *C* is threaded to the same pitch as the staybolts and holds the end of the square steel

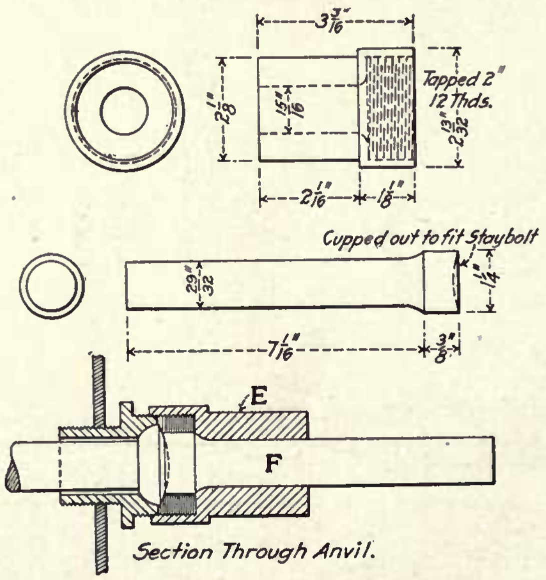



Fig. 371—Anvil for Applying Flexible Staybolts.

driver *D* in the square recess in the head of the staybolt. The driver *D* is revolved by a small crank, which is not shown, making the application of the staybolt a comparatively easy job. After it has been screwed into place, sleeve *E* with anvil *F*, Fig. 371, is applied to hold the head of the bolt while it is being riveted over on the other end.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

### STAYBOLTS, APPLYING.

A chuck for applying and removing staybolts with an air motor or wrench is shown in Fig. 372. The chuck is made of machine steel, with a hardened tool-steel jaw, or grip, and is designed to handle staybolts up to 1¼ in. in diameter. The jaw is set tangent to the center hole, as

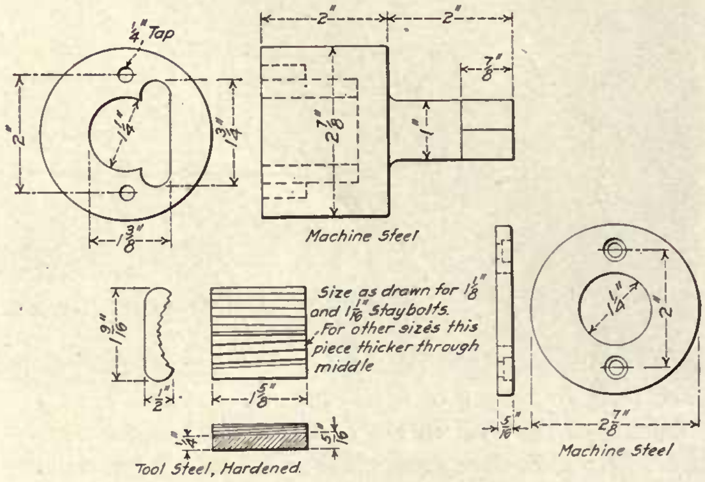



Fig. 372—Staybolt Chuck.

indicated by the sketch, and is provided with both right and left-hand teeth for gripping the bolt in either direction. The jaw is made tapering, with the thick end at the bottom, to take different size bolts. The thickness through the center section is varied, according to the diameter of the bolt. A 5/16-in. washer attached by two ¼-in. setscrews holds the jaw in place. This chuck is simple, strong and efficient. Its action is positive in either direction and there are no moving parts to break or get out of order. The jaws are interchangeable and are quickly removed and replaced.—*S. S. Lightfoot, Bonus Demonstrator, Atchison, Topeka & Santa Fe, San Bernardino, Cal.*

### STAYBOLTS, THREADING RADIAL.

Radial staybolts are ordinarily threaded on a small engine lathe, especially at the head end of the bolt. At the Sayre shops this work is done entirely on bolt machines. The bolts are stripped and the taper fit and facing of the head are done on a horizontal bolt machine, the dies having extensions for making the nick under the head. The bolts are threaded on a vertical machine. The lower head carries the bolt, gripping it on the square end; the movable head carries the chasers, and is let down from above. In cutting threads close to the head, it is necessary to provide a device for tripping the dies. This device is shown, as it is about to operate, in Fig. 373. It

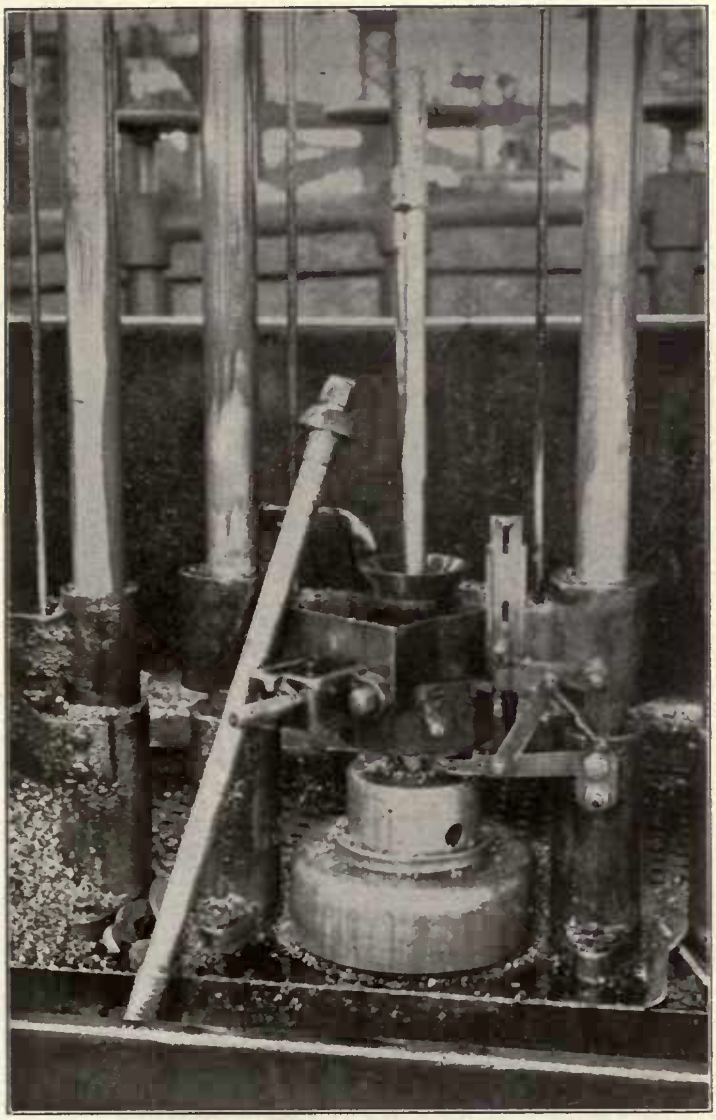


Fig. 373—Threading Radial Staybolts.

allows the dies to approach within 1/32-in. of the head of the bolt, when they are opened.—*Lehigh Valley, Sayre, Pa.*

TUBE CUTTER.

A machine for cutting off the ends of tubes is shown in Fig. 374. It does not differ greatly from other machines used for this work, although it is compactly and efficiently arranged. A 6-in. air cylinder feeds the cutter, which is mounted on a 1½-in. shaft. On the end of this shaft is placed a high speed reamer, used for removing the burrs or for tapering the ends of the tube for welding.

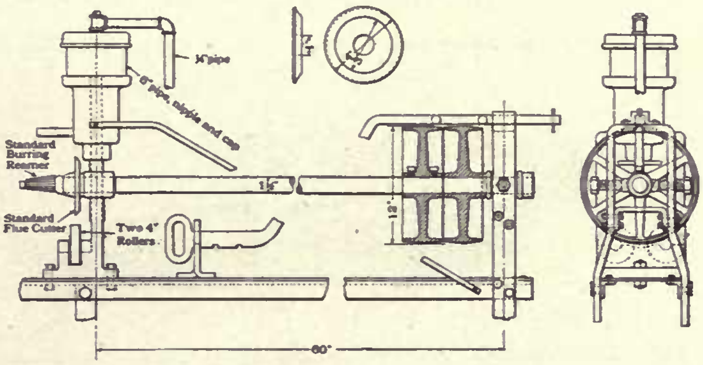



Fig. 374—Tube Cutting Machine.

The belt shifter is placed in a handy position, the handle being located as shown in the sketch.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

TUBE CUTTER.

The tube cutter illustrated in Fig. 375 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 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 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 placed 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 is forced down on it. The cutter is run at a speed of 430 revolutions per minute. —*Delaware, Lackawanna & Western, Scranton, Pa.*

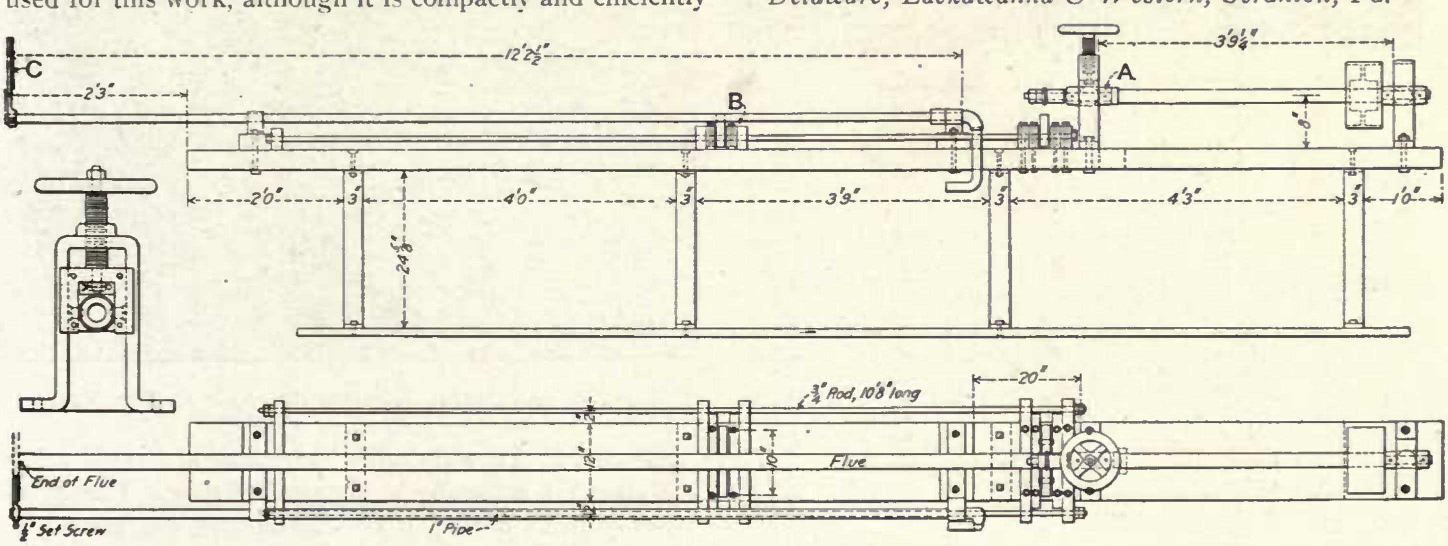



Fig. 375—Tube Cutter.

## TUBE CUTTER.

A most efficient tube cutter has been designed by B. Hendrikson, foreman of the tool room. This tool, which is shown in Fig. 376, is so constructed that an air whistle is blown the instant the cutter wheel has made its way

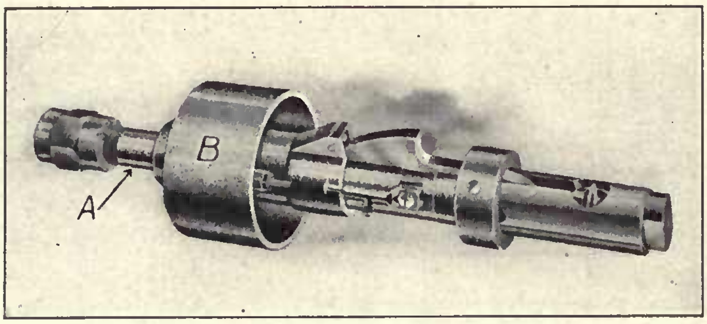



Fig. 376—Tube Cutter.

through the tube, thus notifying the operator that the cut is finished. Another important feature of the tool is the air feed. The tool is driven by a pneumatic motor and air is pumped into the cylinder *B* through the driving shaft *A*, thus affording a means of expanding the cutter disks out against the tube. The tube cutter in operation is shown in Fig. 377. The following test, which was made at the Chicago shops, will give some idea of the

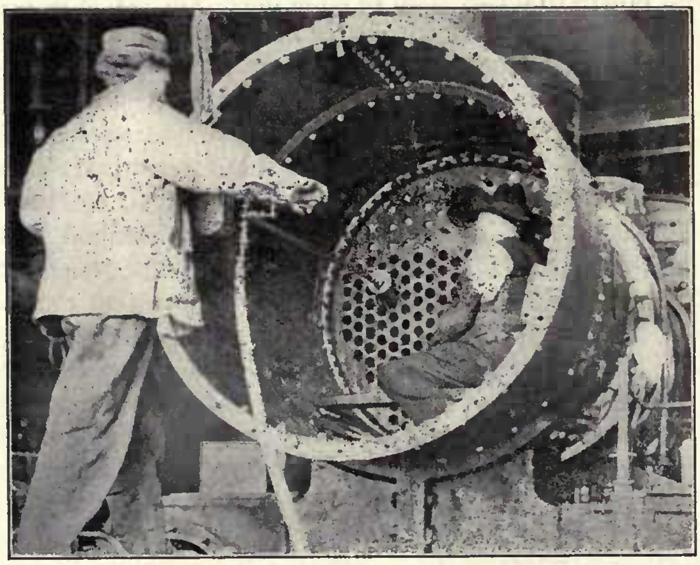


Fig. 377—Tube Cutter in Operation.

rapidity with which the tubes can be cut. The device is patented:

| | No. of tubes cut. | Time (minutes). | Air pressure. | Aver. per tube (seconds). |
|---|---|---|---|---|
| Engine No. 294....... | 125 | 8 | 85 | 3.8 |
| " " 872....... | 271 | 21 | 85 | 4.6 |
| " " 676....... | 191 | 13 | 90 | 4.1 |
| " " 678....... | 224 | 18 | 85 | 4.8 |
| " " 318....... | 291 | 18 | 85 | 3.7 |
| " " 325....... | 291 | 20 | 80 | 4.1 |
| " " 86....... | 284 | 15 | 90 | 3.1 |
| " " 1075....... | 338 | 38 | 85 | 6.8 |
| " " 301....... | 146 | 11 | 85 | 4.5 |
| " " 437....... | 122 | 11 | 80 | 5.4 |
| " " 303....... | 190 | 14 | 80 | 4.4 |

—*Chicago & North Western, Chicago.*

## TUBE CUTTER.

The apparatus for driving a tube cutter and the way in which it is applied are shown in Figs. 378 and 379. The

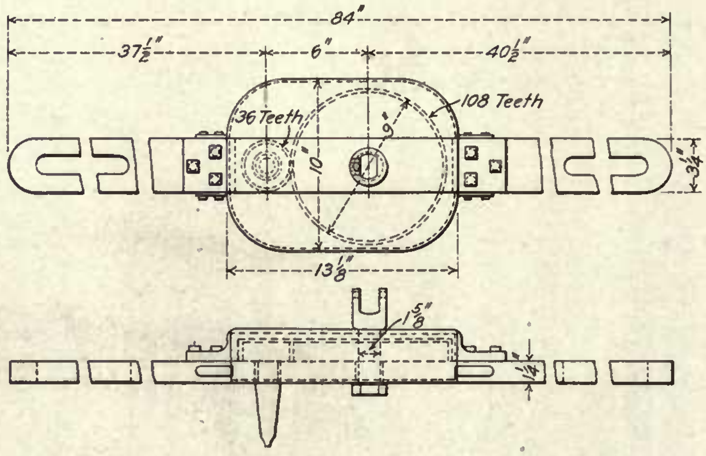



Fig. 378—Gear Box for Tube Cutter.

gears for reducing the motor speed are in a sheet iron case which is attached to the slotted bar. The bar which transmits the motion to the tube cutter is in three parts,

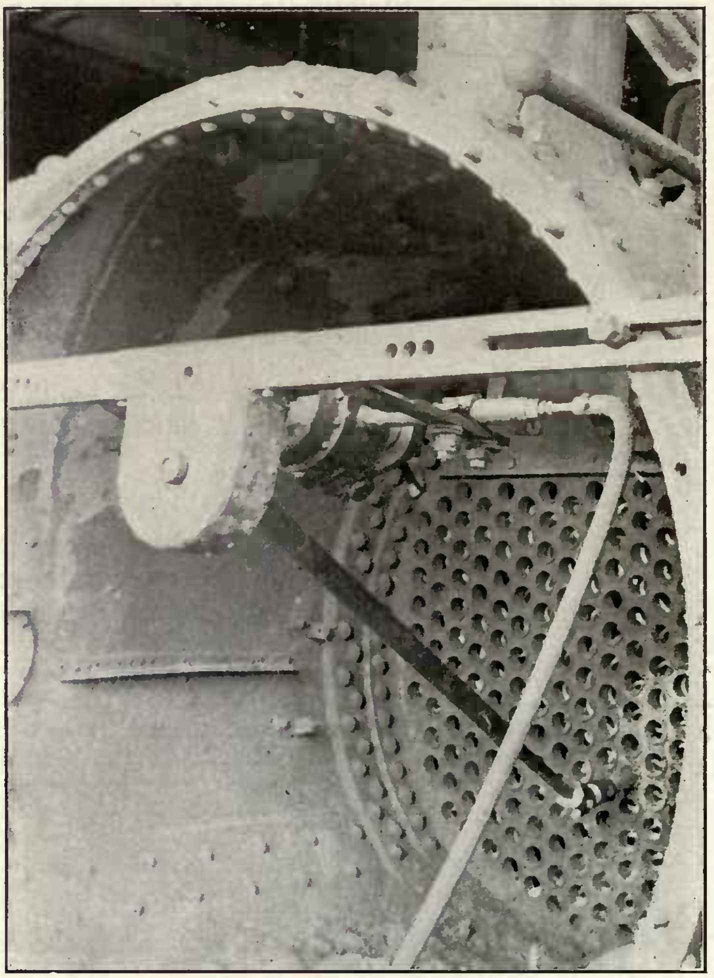


Fig. 379—Apparatus Adjusted for Cutting Out Tubes.

connected by knuckle joints, thus making it flexible and allowing the cutter to be changed from one tube to another without adjusting the gear box. The machine is operated by an apprentice.—*K. J. Lamcool and J. S.*

*Naery, Jr., Special Apprentices, Chicago, Indiana & Louisville, Lafayette, Ind.*

TUBE CUTTER.

The assembled and detailed drawings of the tube cutter, Fig. 380, illustrate a most efficient tool for cutting tubes out of a boiler. Removing a set of tubes, using an air

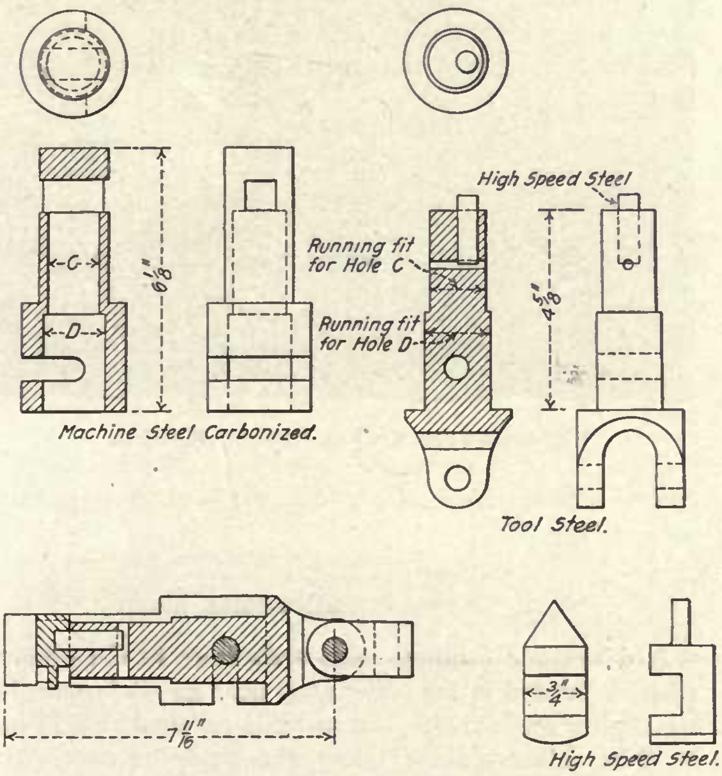



**Fig. 380—Tube Cutter.**

hammer and chisel to cut loose the rolling at the front tube sheet, not only takes from 15 to 20 hours' time, but is a laborious task, as the mechanic is compelled to work in a cramped position, especially in small diameter arches. The simplicity of this tool at once recommends it to the tool maker as well as the user. The outside portion is made of machine steel and the center cylindrical portion of tool steel. This latter part carries a tool steel pin, which fits in the high-speed steel cutter. Reference to the drawing shows that when the inner cylinder is in its extreme position toward the left, the eccentric action of the tool steel pin which engages the cutter, draws the cutting blade inside the tool. When power is applied in the right-hand direction, the eccentric action of the pin forces the cutter out and through the walls of the tube just behind the flue sheet. By completing the circle a band of metal the width of the blade face is cut out of the tube. The power is then reversed, which throws the blade back into the tool and permits its withdrawal from the tube. This tool is intended for use with an air motor, the toggle permitting a universal joint connection to a bar, one end of which has a Morse taper end for inserting in the motor socket. The air motor is swung in the arch on the center line of the boiler, and the universal joint permits cutting out the entire set of tubes without changing the position of the motor. The motor should have a quick reversing arrangement, as the tool makes but one revolution in cutting and one in the opposite direction for removing. The tool foreman at Meadville, John Hessler, who designed this tool is authority for the statement that it will cut a set of 326 tubes in five hours, which, with an air hammer and chisel, would take about three times as long.—*Erie Railroad, Meadville, Pa.*

TUBE CUTTER.

The machine for cutting out boiler tubes, shown in Fig. 381, was invented by John T. Fuhrman, foreman of the tool room of the Great Northern shops at St. Paul, Minn. There are three 11/16-in. circular cutters, which are forced out to the cutting position by a three-sided, tapered spindle, actuated by the pneumatic cylinder. The cutters are held to their normal position by a coil spring at each end, shown in the longitudinal section and the cross-section on line *B*. The cutter is driven by an end-spindle air motor, also the invention of Mr. Fuhrman. These motors have been in use on the Great Northern for a long time, there being about 190 in service at present. They are designed for close-quarter work and are, therefore, especi-

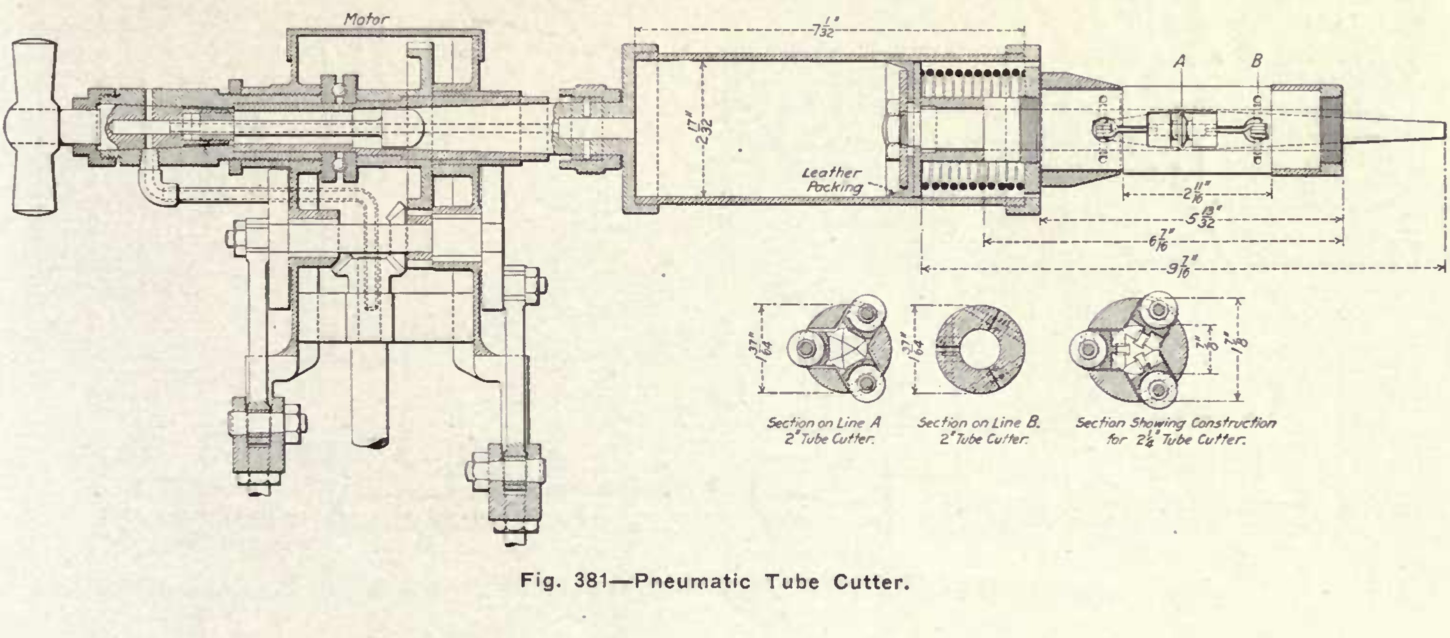



**Fig. 381—Pneumatic Tube Cutter.**

ally adapted for use with this flue cutter, enabling the flues to be cut out at both ends without trouble. The device is easily handled by one man, motor and cutter together weighing only 36 lbs. It will cut as high as 18 flues a minute, and do it smoothly, without burring the ends, leaving them in shape for welding. A set of cutters has a life of more than 3,000 cuts. The device has been in use more than a year and the inventor has applied for a patent on it—*Great Northern, Dale Street Shops, St. Paul, Minn.*

### TUBE CUTTER.

A device for cutting out tubes is shown in the photograph, Fig. 382, and the drawing, Fig. 383. The tool holder *B* is first inserted in the tube, after which the cutting tool is placed and the point driven through the tube wall. Only one revolution is necessary for the cut-off. The photo shows clearly the assembled device and the method of hanging it with the block and fall. The large gear wheel *U* is mounted on the spindle which carries the cutting tool, and the power of the motor is transmitted through the gears *V* and *W*. This arrangement greatly increases the power and at the same time reduces the speed. The flexibility of the device in adjusting it to the different tubes is shown in the illustration, and this one feature should recommend it as a simple and rapid tube cutting tool.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

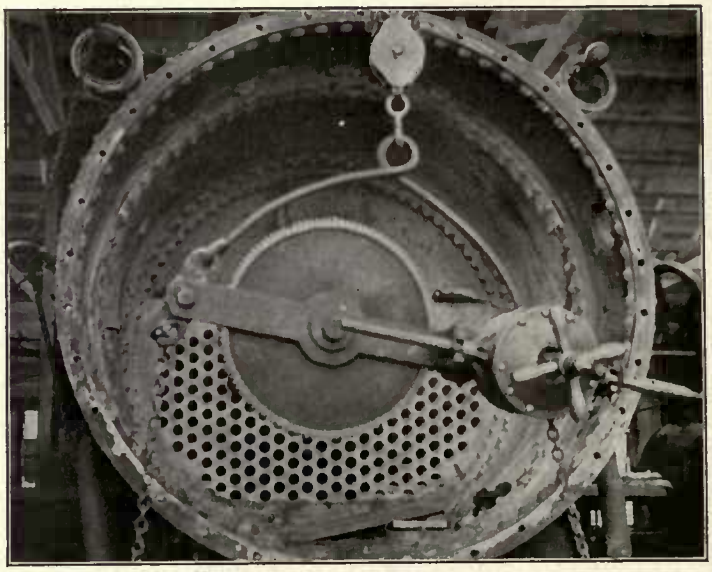
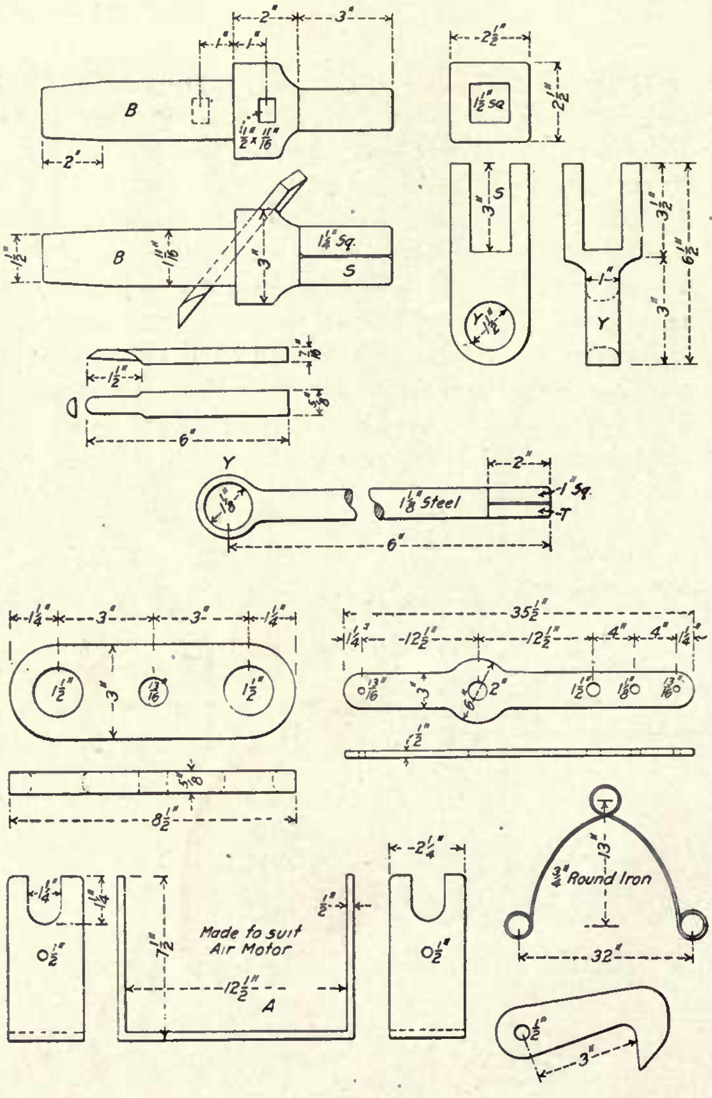


Fig. 382—Tube Cutting Tool in Position.

### TUBE, DIES FOR FORMING BRICK ARCH.

A device for forming brick arch tubes to the proper shape is located in the boiler shop near an oil furnace in which they are heated. The power is supplied by a 14-in. x 10-in. driver brake cylinder, the air being controlled



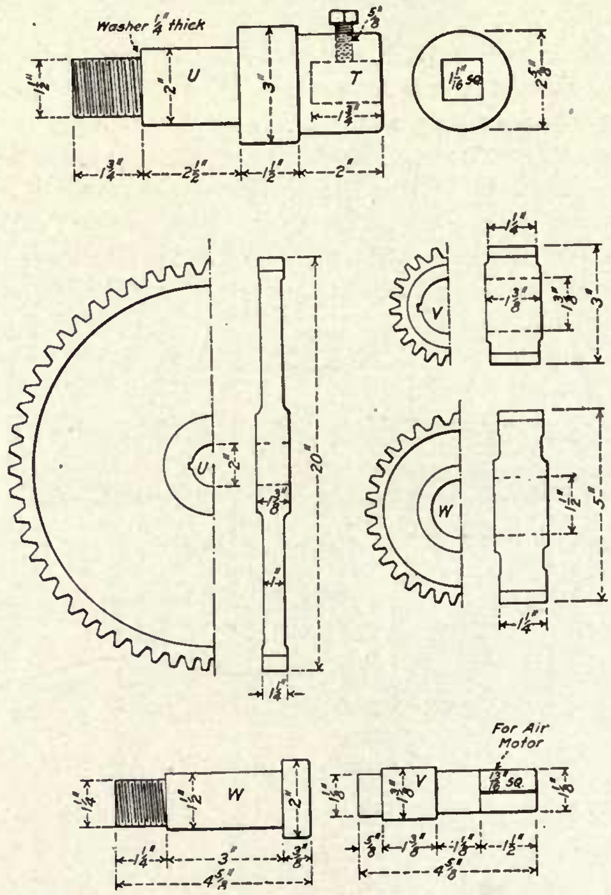




Fig. 383—Tube Cutting Tool Details.

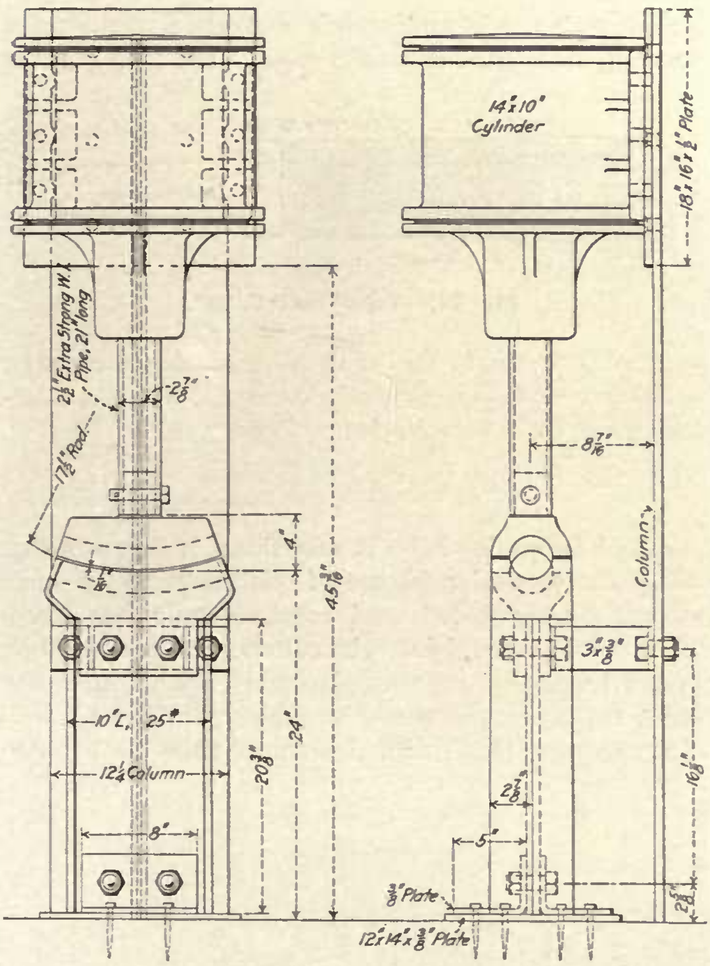



Fig. 384—Press for Forming Brick Arch Tubes.

by a foot valve. The construction of the press and of the formers is clearly shown in Figs. 384 and 385.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic, and Henry Holden, General Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

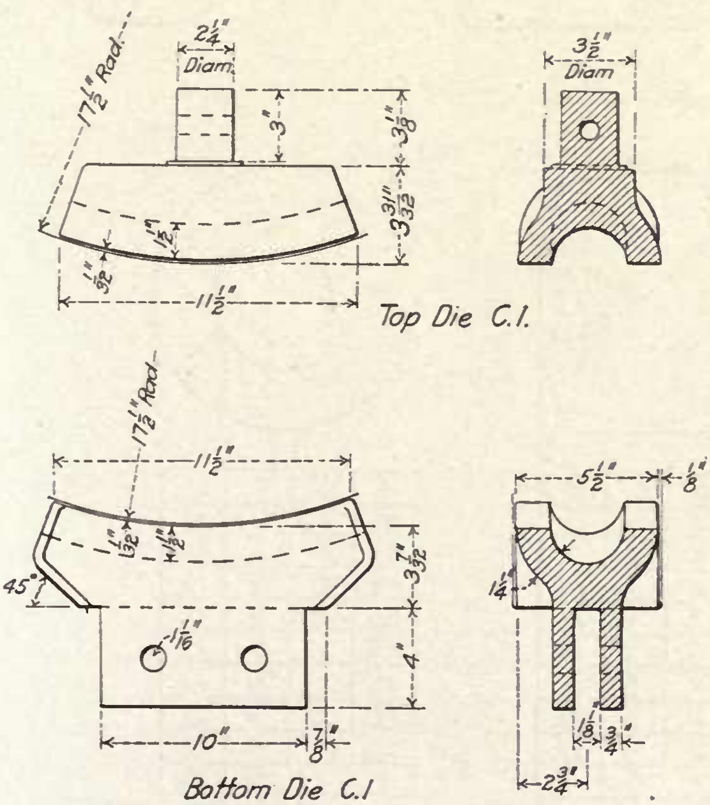



Fig. 385—Dies for Forming Brick Arch Tubes.

TUBE EXPANDER.

An efficient tool for expanding tubes and one which is used in all the shops of the Erie, is shown in Fig. 386. This tool differs from the well-known expander of this general type, in that the three ⅝-in. cold rolled steel rollers are set at an angle of 3½ deg., as shown, instead

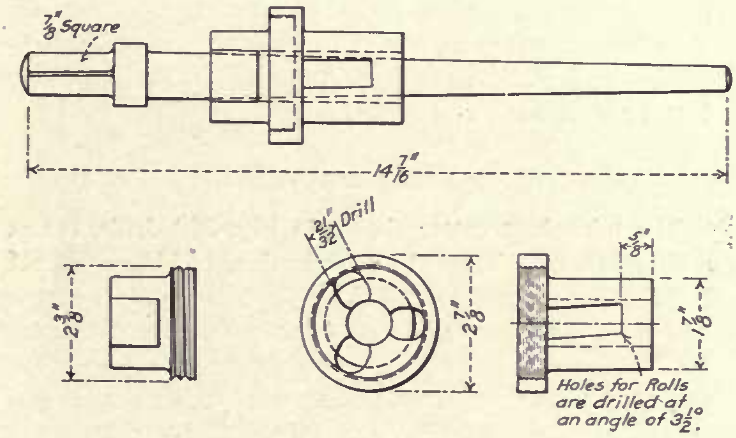



Fig. 386—Flue Expander.

of being parallel to the center line. In using an expander in which the rolls are set parallel to the center line it is necessary to expand the rolls by striking the end of the spindle. This not only tends to strain the fibers of the tube metal but makes a more or less uneven roll, and also shortens the life of the spindle by battering its end. With the rolls set at an angle the feed is automatic, as is also the withdrawal of the tool when revolving the spindle in the opposite direction.—*Erie Railroad, Meadville, Pa.*

TUBE-SHEET CUTTER.

A special tool for drilling tube-sheets is shown in Fig. 387. The rose bit *A* is inserted in the small hole in the sheet and the drill *B* cuts the tube hole to the proper size.

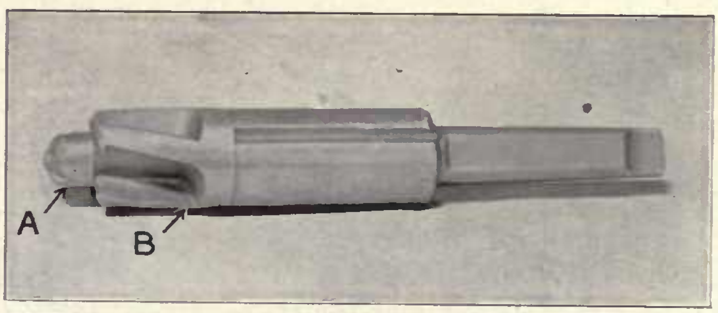



Fig. 387—Tool for Drilling Tube-Sheets.

A hole can be drilled in from 32 to 35 seconds with this tool.—*Chicago & North Western, Chicago.*

TUBE-SHEET CUTTER.

A high-speed tube-sheet cutter with a soft steel arbor, for drilling holes in tube-sheets on a drill press, is illustrated in Fig. 388. The cutter has two cutting faces similar to a twist drill. A carbon steel rose bit cutter serves as a nut to hold the cutter on the arbor. The cutter reams out the punched holes to 1 3/16 in. in diameter and it is properly centered. The use of the cutter has greatly increased the efficiency of this class of work. With the old-style cutter 15 holes were drilled per hour at a cost of 1.33 cents per hole on the basis of labor at 20 cents per hour. With the new cutter the same operator drills 60 holes per hour, at a cost of .33 cents per hole. . This is a reduction in cost of 1 cent per hole, or 75 per cent. The total saving per year by the use of this cutter in our shop over the old methods is $522.—*E. J. McKernan, Supervisor of Tools, Atchison, Topeka & Santa Fe, Topeka, Kan.*

### TUBE-SHEET CUTTER.

The tube-sheet cutter shown in Fig. 389 drills, reams and removes the burrs at one operation, making a perfect hole. It is possible to cut 247 2¼-in. holes in eight hours. The shank and body are made of soft steel and the center is of tool steel. The cutter, reamer and burr remover are made of high-speed steel. This tool, with reamer attached, makes tight and perfect application of the tubes possible. It is used on a drill press. The spring in the tool holds the tit in the small hole, guiding the cutter. —*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

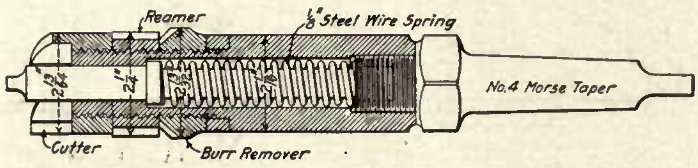
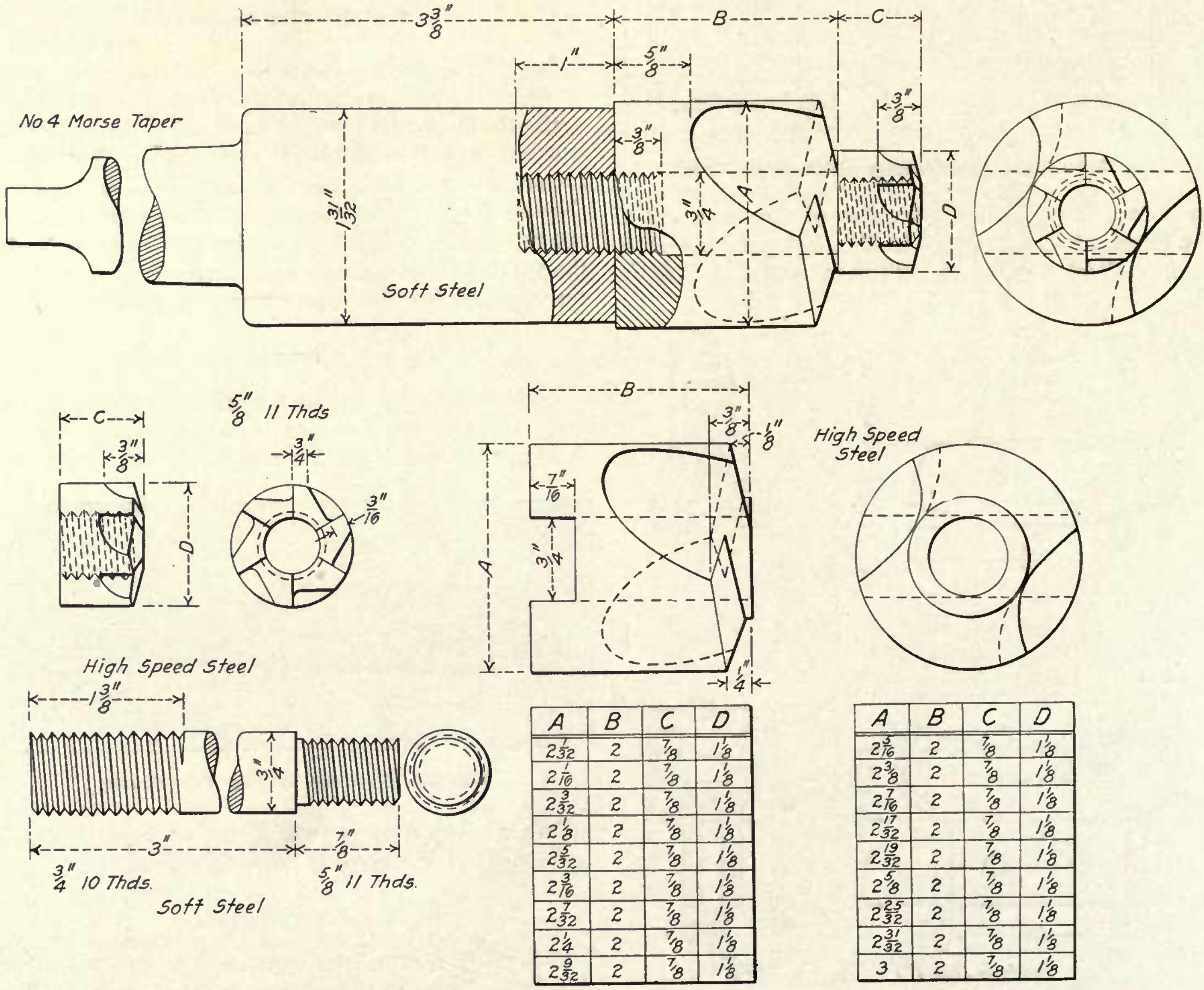



Fig. 389—Tube-Sheet Cutter.

### TUBE-SHEET CUTTER.

A tool for cutting holes in tube-sheets is shown in Fig. 390. The particular feature of this holder is the small amount of high-speed steel required—only two pieces ⅜-in. x ¾-in. x 2⅛-in. The cutters are sawed to their proper length and are then placed in a special jig in the lathe, four at a time, turned to the proper diameter with clearance, and bored with clearance on the inside. An-




| A | B | C | D |
|---|---|---|---|
| 2 1/32 | 2 | 7/8 | 1 1/8 |
| 2 1/16 | 2 | 7/8 | 1 1/8 |
| 2 3/32 | 2 | 7/8 | 1 1/8 |
| 2 1/8 | 2 | 7/8 | 1 1/8 |
| 2 5/32 | 2 | 7/8 | 1 1/8 |
| 2 3/16 | 2 | 7/8 | 1 1/8 |
| 2 7/32 | 2 | 7/8 | 1 1/8 |
| 2 1/4 | 2 | 7/8 | 1 1/8 |
| 2 9/32 | 2 | 7/8 | 1 1/8 |

| A | B | C | D |
|---|---|---|---|
| 2 5/16 | 2 | 7/8 | 1 1/8 |
| 2 3/8 | 2 | 7/8 | 1 1/8 |
| 2 7/16 | 2 | 7/8 | 1 1/8 |
| 2 17/32 | 2 | 7/8 | 1 1/8 |
| 2 19/32 | 2 | 7/8 | 1 1/8 |
| 2 5/8 | 2 | 7/8 | 1 1/8 |
| 2 25/32 | 2 | 7/8 | 1 1/8 |
| 2 31/32 | 2 | 7/8 | 1 1/8 |
| 3 | 2 | 7/8 | 1 1/8 |

Fig. 388—High-Speed Flue-Sheet Cutter.

other special feature is the provision for breaking the sharp corners on the tube hole. This is done by leaving a fillet on the cutter. The cutters are held rigid in the

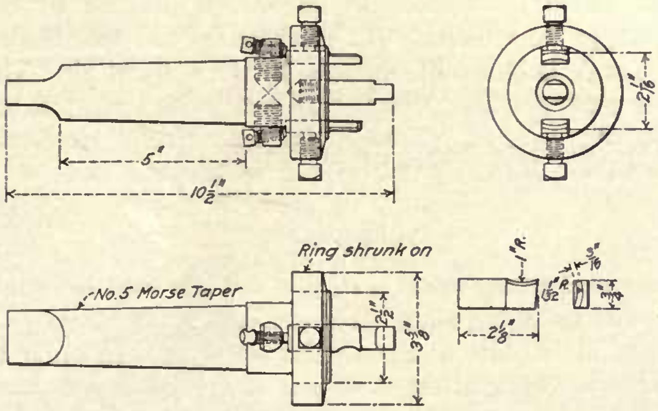


Fig. 390—Tool for Cutting Tube-Sheet Holes.

holder, which is provided with thrust screws by which accurate adjustment of the cutters can be obtained. With this tool the tube holes are cut and the corners chamfered in one operation at the rate of 60 holes per hour.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

TUBE-SHEET CUTTER.

A tool for cutting tube-sheet holes is shown in Fig. 391. The taper shank is made to fit the socket of a drill press. The cutter C slips over the end of the bar, to which it is secured by a pin or key. The bottom of the cutter is fluted similar to a milling cutter and operates in the same way. This tool will drill 200 holes in a ½-in.

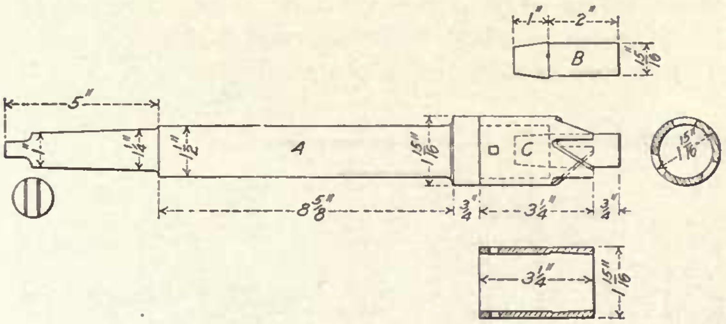


Fig. 391—Tube-Sheet Cutter.

flue-sheet in about one hour and forty-five minutes.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

TUBE SWEDGING MACHINE.

The tube swedging machine, shown in Fig. 392, is easily and cheaply made from old material. The bed is a 13-in. channel, about 10 ft. long. To one end of this channel is bolted the upright which holds the air cylinder used for clamping the tube. The second cylinder is mounted horizontally at the opposite end of the bed plate. On the end of the piston rod of this second cylinder are screwed the formers, either the one shown for swedging down the firebox end of the tube, or the pin former for expanding the ends of tubes for large holes rather than to use a ferrule. An oil furnace is placed near the machine for heating the tube ends. When the tube is placed on the V-block the air is turned on. The piston in the vertical cylinder responds first, clamping the tube in posi-

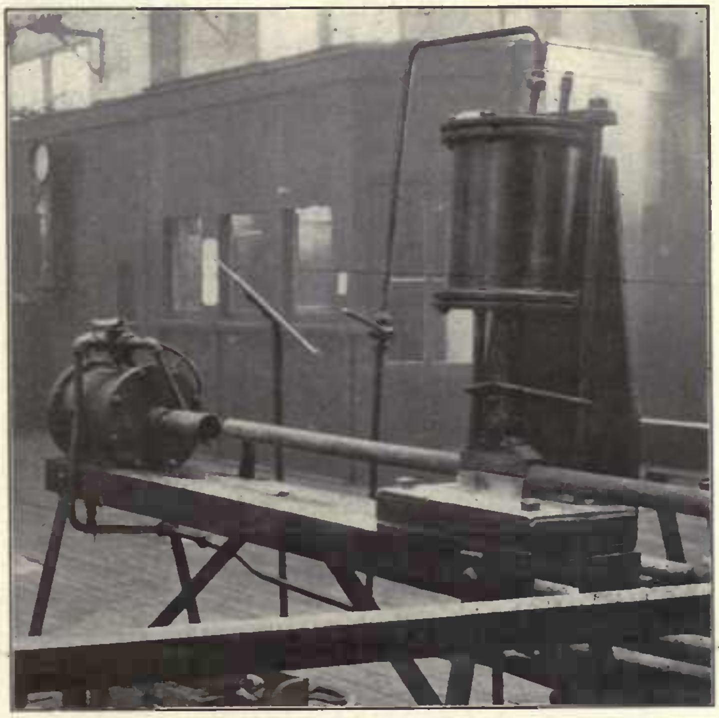


Fig. 392—Tube Swedging Machine.

tion, after which the piston of the second cylinder acts to move the forming die against the end of the tube.—*Central Railroad of New Jersey, Elizabethport, N. J.*

TUBE TESTING MACHINE.

An arrangement for testing tubes with cold water which have had new safe ends welded on is shown in Fig. 393. The set of tubes on the buggy shows 24-in. safe-ends that have just been welded on. At the extreme left of the

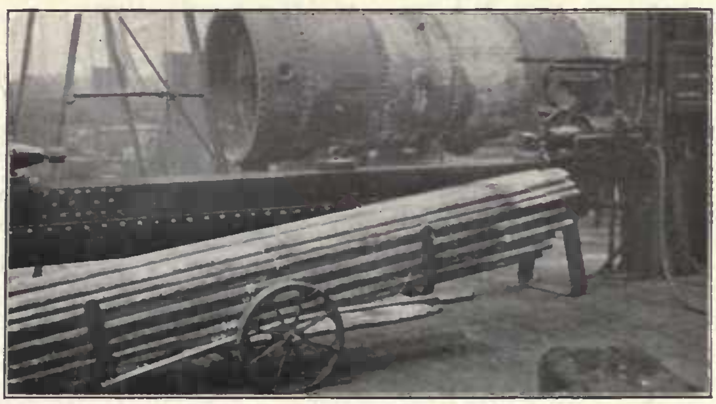


Fig. 393—Tube Testing Machine.

illustration is seen the plunger against which one end of the flue is held, while the near view of the right hand end of the machine, Fig. 394, gives a good idea of the plunger cylinder arrangement and the water supply. The bed of the machine is made of two metal plates, riveted to the feet. The semi-circular bottom binds the vertical

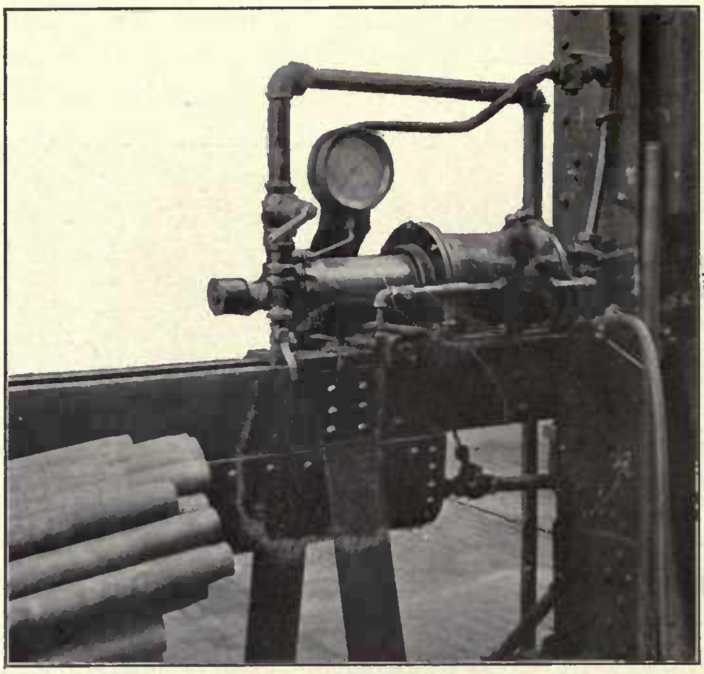


Fig. 394—Operating End of Tube Testing Machine.

plates together, making a tank into which the waste water falls. The tubes are handled from buggy to buggy, one being placed on each side of the machine. A set of tubes can be tested in a comparatively short time.—*Central Railroad of New Jersey, Elizabethport, N. J.*

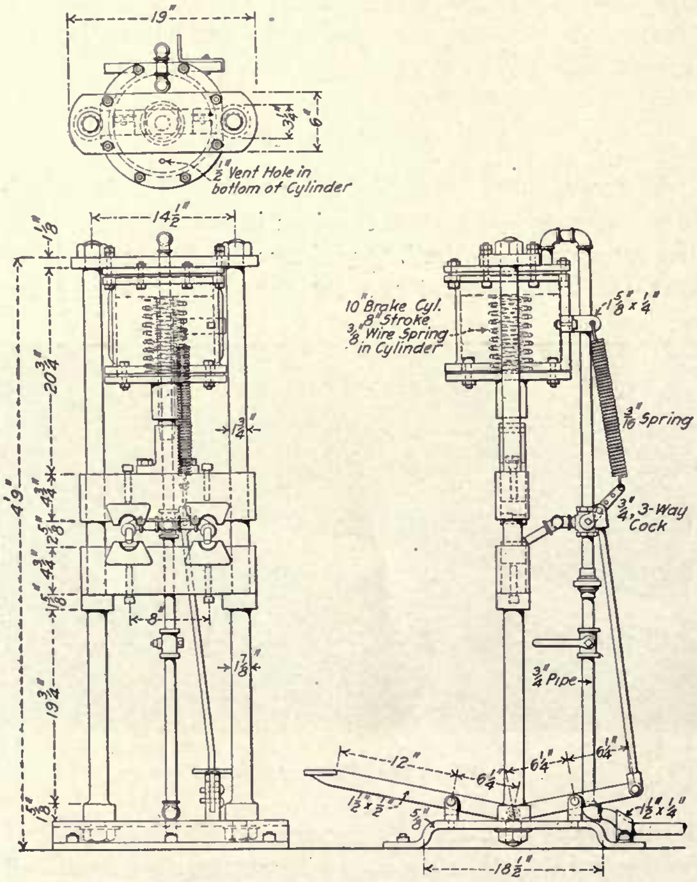



Fig. 395—Tube Swedging Machine.

TUBE SWEDGING MACHINE.

A tube swedging machine, which is made from a 10-in. brake cylinder with an 8-in. stroke is shown in Fig. 395. The piston is returned to its normal position by the spring in the cylinder. The machine has two sets of dies. The scale is blown off the tube by the exhaust air. The foot pedal operates a three-way cock, which controls the flow of air.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

TUBE WELDER.

A novel arrangement is used in the flue shop for welding and swedging tubes. The shop originally possessed a single flue-welder of the usual roller type. In order to do the swedging at the same heat as the welding, 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. It drives the two heads in the same direction, and as soon as a safe end is welded on it is pushed into the swedger and finished. This, in combination with the oil furnace, enables the work to be turned out with great rapidity.—*Delaware, Lackawanna & Western, Scranton, Pa.*

TUBES, APPLICATION AND MAINTENANCE.

In common with other railways the Pennsylvania has experienced much trouble from leaky tubes, and while on most roads this is attributed to bad water or improper methods of feeding, filling and cooling boilers, on the Pennsylvania, where there is a good water supply and proper methods of handling water are employed, it was found that a large part of the tube leakage was caused by irregular methods of setting and tightening tubes. The practice at different shops and roundhouses was not

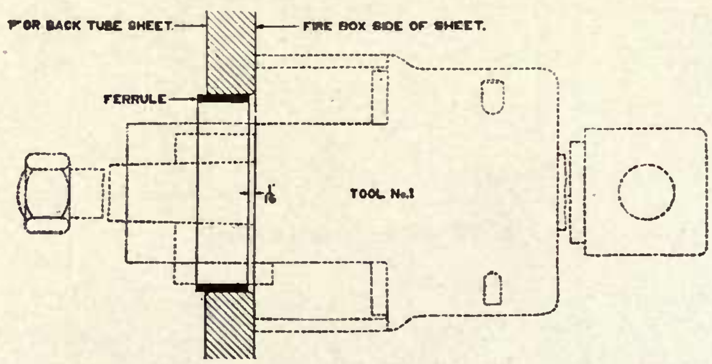



Fig. 396.

uniform, and when a passenger locomotive passed over several divisions and required tube repairs, the work was not always done in such a manner as to prevent leakage. In other words, tube repairs were not sufficiently standardized to obtain the desired results. After careful investigation, the best practice for setting tubes at shops and engine houses, the best method of maintaining tubes at engine houses, the best method of preventing leaky tubes when engines arrive at terminals, and the proper tools for tube work, were all standardized and printed in a circular which was approved in June, 1909, by the lines East and West. Since the adoption of this standard tube practice the number of leaky tubes on the Pennsylvania Lines has been materially reduced.

Tubes must be in accordance with standard specifications and must be ordered .120 in. thick. Material for safe ends must be in accordance with standard specifications and must be ordered .134 in. thick. Ferrules must

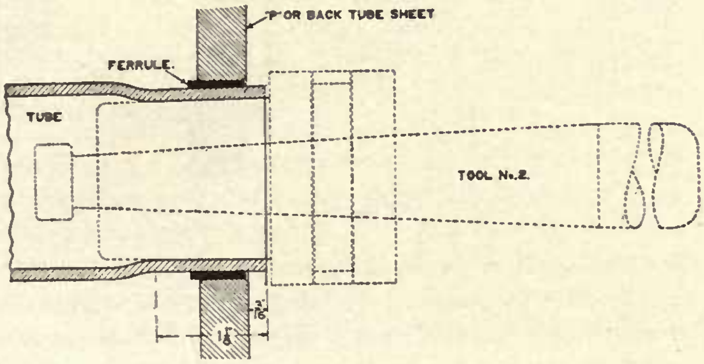



Fig 397.

be made of soft copper and 1/32 in. longer than the thickness of the tube sheet, and must be ordered .075 in. thick. The outside diameter must be the same as the outside diameter of the tube. Tube holes in the firebox tube sheet must be the same diameter as the outside of the tube and a 1/16 in. radius fillet must be provided on each edge of the tube holes.

When the tube hole in the firebox tube sheet becomes 1/8-in. out of round it must be reamed. Tube holes in the smoke box tube sheets must be 1/16-in. larger in diameter

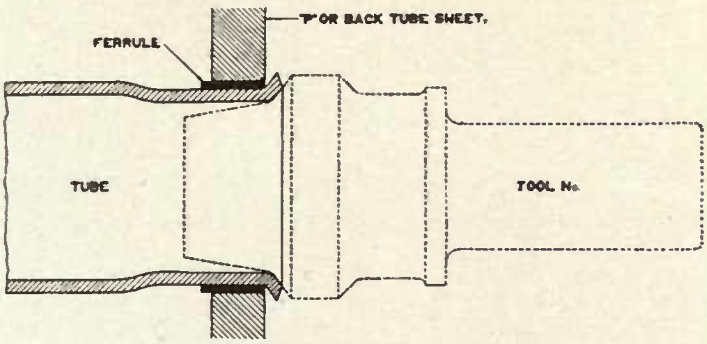



Fig. 398.

than the outside diameter of the tube and sharp edges of the tube holes must be removed. The firebox end of the tubes must be swedged down with a slight taper towards the end of the tube to a diameter sufficiently small to allow the end of the tube to neatly fit the ferrule after it has been rolled in the tube hole. The swedged end of the tube must not be less than 1 1/8-in. long, as shown in Fig. 397.

All tools for working tubes in locomotive boilers must be in accordance with standard tracings and the tool numbers must be stamped on each tool with 1/4-in. figures. Each tool must be used for the operation specified. All tools No. 5, Fig. 401, must be maintained within the limits of standard gages and tools No. 4, Fig. 399, must be

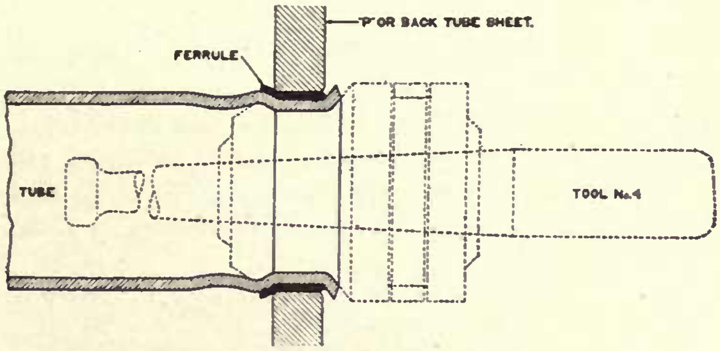



Fig. 399.

taken out of service when worn hollow 1/32-in. between the fillets.

*Application of Tubes in Shops and Engine Houses.*—Operation No. 1.—Ferrules must be placed in the tube

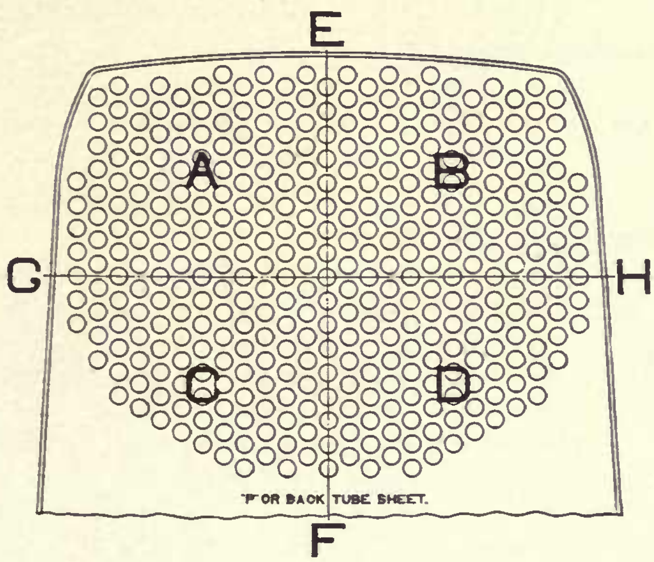



Fig. 400.

holes in the firebox sheet, as shown in Fig. 396, and rolled tight with tool No. 1.

Operation No. 2.—Tubes must be placed in the tube holes in the firebox tube sheet neatly fitted, as shown in

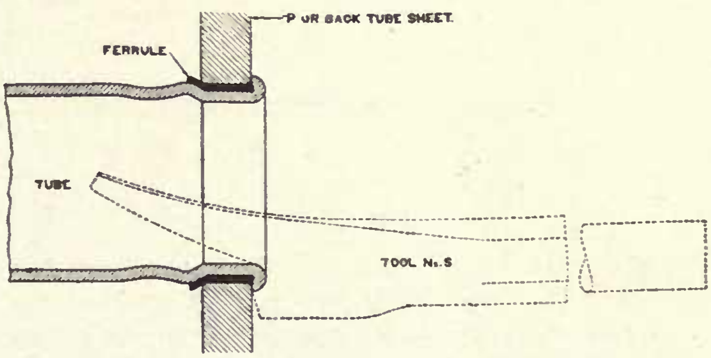



Fig. 401.

Fig. 397, and tightened with tool No. 2. (Operations Nos. 7 and 8, respectively, must be performed after operation No. 2 is completed and prior to commencing operation No. 3.)

Operation No. 3.—Firebox ends of tubes, as shown in Fig. 398, must be opened with tool No. 3, using either a pneumatic or a hand hammer.

Operation No. 4.—Firebox ends of tubes, as shown in Fig. 399, must be expanded with tool No. 4. This operation should be done on the tubes along the lines *E-F* and *G-H* respectively, as shown in Fig. 400, and then sections *A, B, C* and *D* should be worked out by performing this operation in each section commencing at the outer edge of the sheet in working the tubes in these sections in circumferential rows toward the center.

Operation No. 5.—Firebox ends of tubes, as shown in

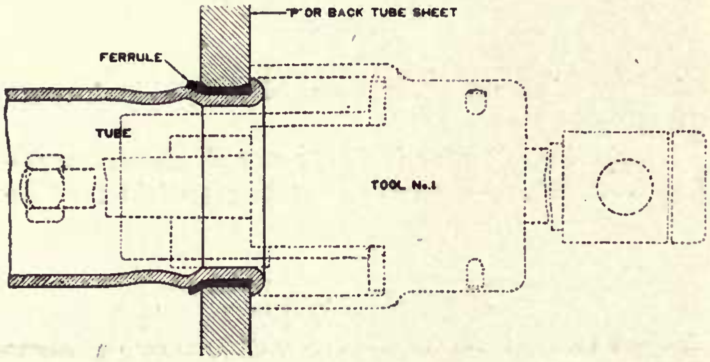



Fig. 402.

Fig. 401, must be beaded with tool No. 5, using either a pneumatic or a hand hammer.

Operation No. 6—Firebox ends of the tubes, as shown in Fig. 402, may be slightly rolled with tool No. 1, if necessary.

Operation No. 7.—Smoke box ends of tubes, as shown in Fig. 403, must be tightened with tool No. 6.

Operation No. 8.—Smoke box ends of tubes, as shown in Fig. 404, must be rolled with tool No. 1.

*Maintenance of Tubes at Engine Houses.*—Tubes which are slightly leaking at the firebox end of the locomotive

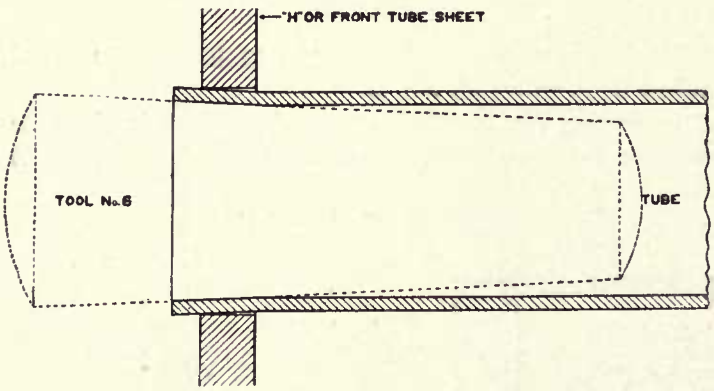



Fig. 403.

boilers in service must be tightened with tool No. 4 if necessary, after which beads must be reset with tool No. 5. Tubes which are slightly leaking at the smoke box must be tightened with tool No. 1. When a locomotive arrives at an engine house with the tubes leaking so badly at the firebox end that it must be taken out of service, the boiler must be drained, after which the firebox ends of tubes must be reset with tool No. 4 and the beads then reset with tool No. 5. When the tubes will not stand resetting with tool No. 4, they may be rolled with tool No. 1, after which the beads must be reset with tool No. 5. (Tool No. 1 *must not* be used except when in the judgment of the foreman it is necessary.)

*Prevention of Leaking Tubes.*—In order to reduce the

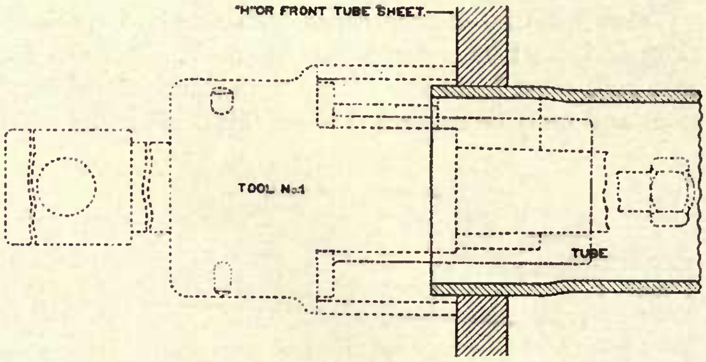



Fig. 404.

tube leakage to a minimum the following practice must be followed: When fires are being cleaned or drawn the blower should be used only sufficiently hard to prevent smoke emitting from the fire door. All fires must be banked at the tube sheet except in the fire boxes having front grates bricked off, in which case the fire should be banked over the adjoining grates. Unless absolutely necessary injectors should not be used while the fires are being cleaned, also when no fire is in fireboxes, nor while locomotives are being moved under their own steam in the engine yards without first brightening up the fire.—*Pennsylvania Railroad Standard Practice.*

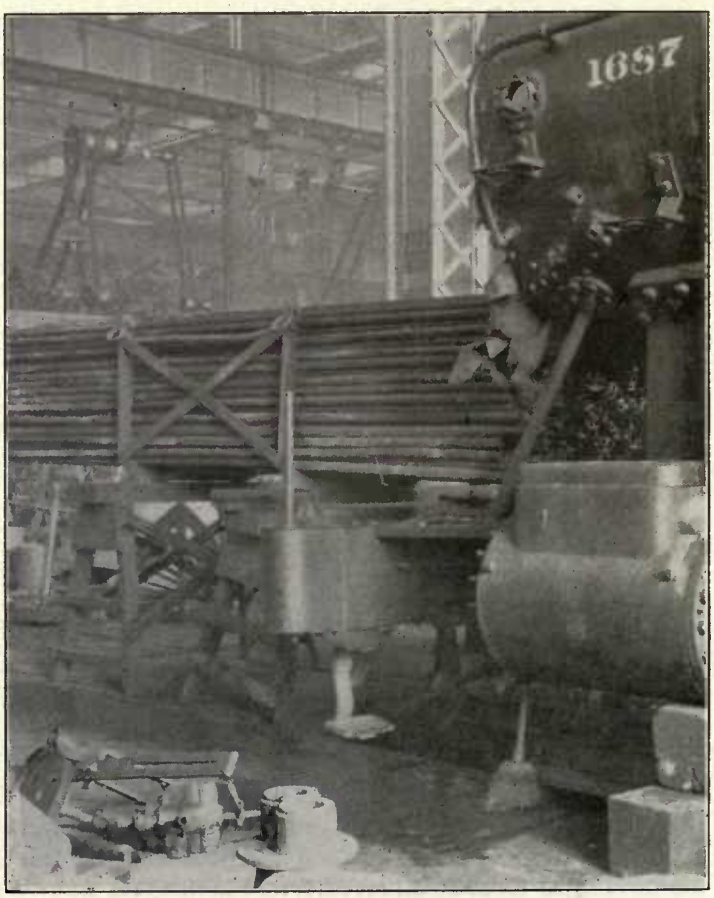



Fig. 405—Crate for Handling Boiler Tubes.

TUBES, CRATE FOR HANDLING.

The crate of tubes shown in front of the locomotive in Fig. 405 illustrates the method of handling boiler tubes to and from the flue shop. When they are removed from the boiler, they are dropped into the crate, as shown. It is then lifted and transferred by the traveling crane, the rings at the top of the crate being connected to the crane hook by chains.—*Lehigh Valley, Sayre, Pa.*

WASHOUT PLUGS, CORNER PATCH FOR.

A set of dies for making corner patches for washout plugs is used in the hydraulic sectional flanger. The male die is 5 63/64 in. in diameter and fits in the vertical ram of the machine; the lower die is 11 in. long, shaped at the top with a 5⅞-in. radius, as shown in the drawing, Fig. 406. A 1⅛-in. hole is drilled in the bottom end of the upper die and a taper keyway is cut through the die to hold the punch, which is 2 in. in diameter, in place. A ⅝-in. hole is punched in the sheet which is to form the patch, after which it is heated and placed between the dies. It is bent and the hole is flanged for the washout plug in one operation. After the dies have been closed the taper key is removed and the 2-in. pin is forced clear

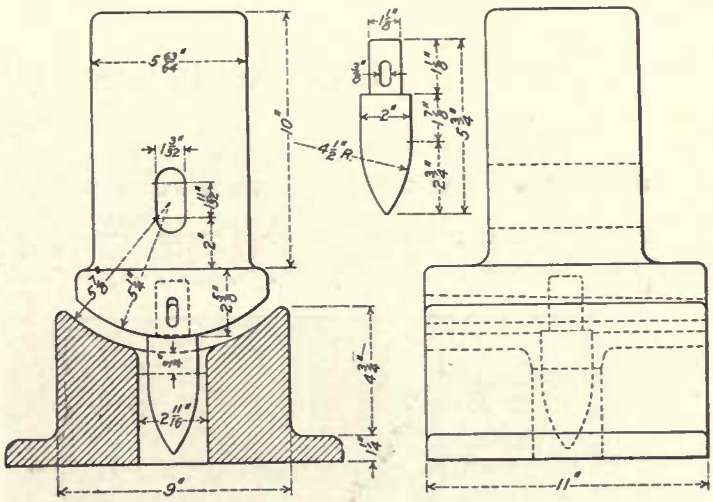


Fig. 406—Dies for Forming Corner Patch for Washout Plug.

through the hole in the patch.—*Rock Island Lines, Silvis, Ill.*

# Oxy-Acetylene Welding and Cutting

TOPEKA SHOPS; ATCHISON, TOPEKA & SANTA FE.

The oxy-acetylene method of autogenous welding of metals has been in use in this country, to a very limited extent, for a number of years. The feasibility of welding steel or iron by this method has been fully demonstrated, and although the possibilities of the oxy-acetylene process are very great, railways have been slow to take advantage of the savings to be made by this method. The reason is that the apparatus now on the market is very expensive and too small for railway needs. Most of the plants are unable to run over five hours with two burners without stopping to recharge.

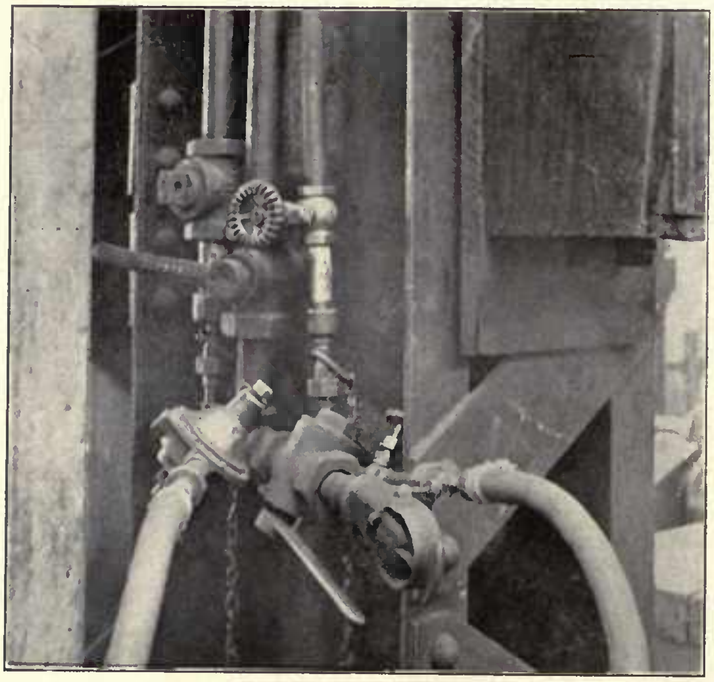


Fig. 407—Hose Connections from Pipe Line to the Burner.

The application to a large shop seems to have been lost sight of by the manufacturers of oxygen and acetylene, and it has been left to the railways and large manufacturing companies to develop the details. Preliminary investigations covering several years were made by a western railway, and it became convinced that the oxy-acetylene process of welding metals would be both practical and economical to use in railway repair shops. It

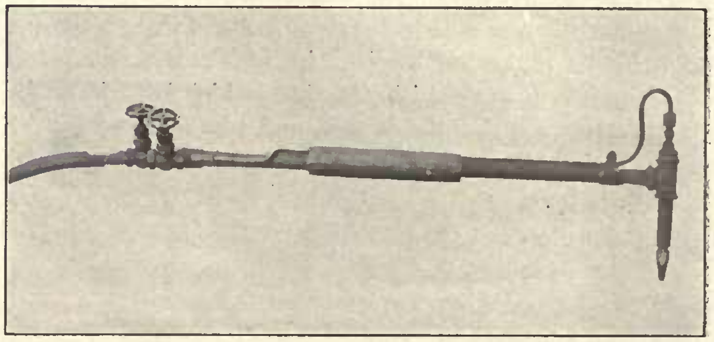


Fig. 408—Burner for Work in a Horizontal Position.

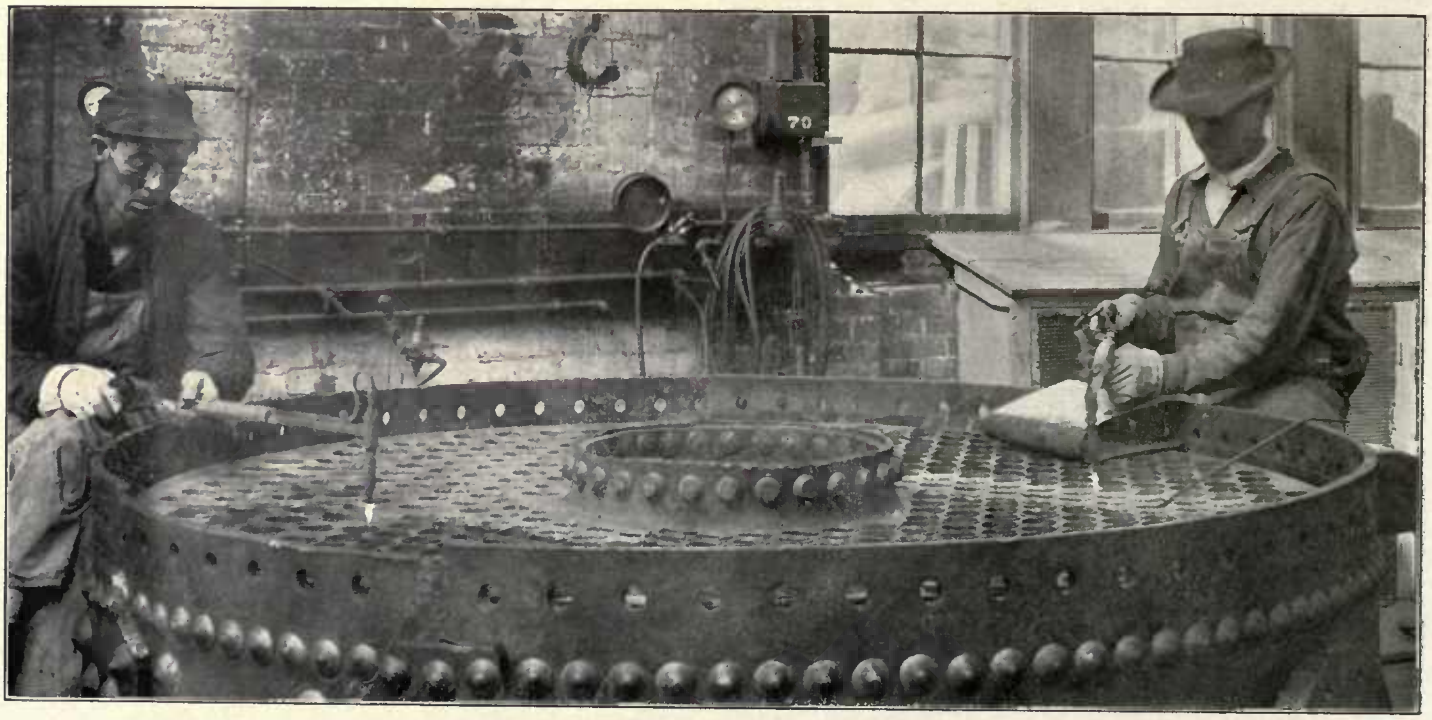


Fig. 409—Welding Tubes in a Jacobs Superheater by the Oxy-Acetylene Process.

was discovered that there was but little expert knowledge that could be obtained and the development was carried on by shop employees.

Portable plants were considered undesirable, as each one would require expert attention and would necessarily be intermittent in its action, due to the charging of the gas tanks. It is necessary to purchase the oxygen

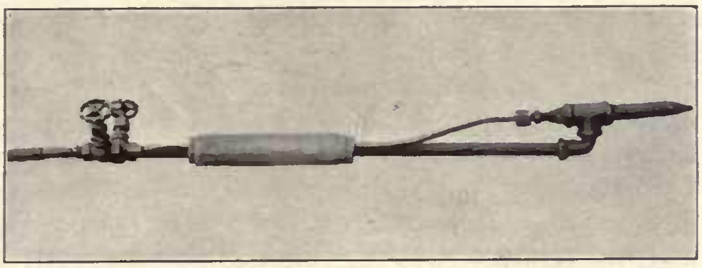


**Fig. 410—Burner for Work in a Vertical Position.**

in drums from a manufacturing company and, as it often comes from a great distance, delays in shipment of the drums would result in the entire stoppage of the welding plant. The oxygen is kept at a very high pressure, often as high as 1,800 lbs. per square inch, which would mean great difficulty in keeping the joints tight and consequent

**Fig. 411—Boiler Tubes Welded in Flue Sheet of Jacobs-Shupert Firebox.**

loss from leakage, as well as danger from explosions. Taking everything into consideration, it was decided to build a central plant and equipment has been installed at one shop consisting of a stationary central generating

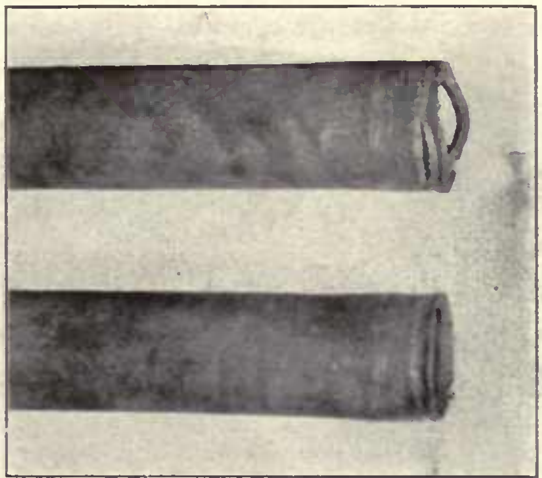


**Fig. 412—Rolled and Beaded Boiler Tubes Pulled from Sheet.**

plant, the oxygen and acetylene being distributed among the different shops through pipe lines.

*Oxygen and Acetylene.*—The oxygen is generated from calcium oxy-chloride, iron sulphate and copper sulphate, as it was found that this was cheaper than the usual chlorate of potash method and could be done with much less complicated apparatus. The oxygen passes into an ordinary gasometer where it is stored until drawn out by the compressor. Storage tanks are provided and are so arranged that any one of them may be charged or

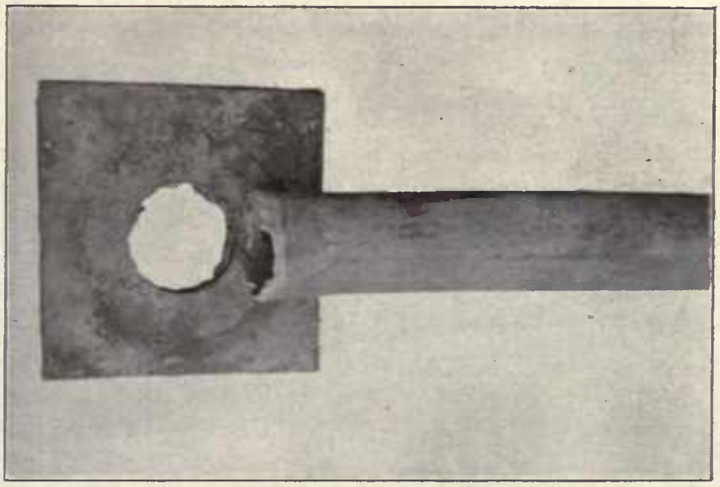


**Fig. 413—Welded Tube Pulled from Sheet.**

discharged independently. A pressure of from 60 to 70 lbs. per square inch is maintained in the storage tanks while the plant is in operation. This pressure is reduced to 20 lbs. as the oxygen leaves the storage tanks, in order to minimize the loss due to leakage. A separate pipe line, carrying the full storage tank pressure, is used to take care of the burner when used for the cutting process. The acetylene is generated by an automatic water-to-carbide feed generator designed by employees of the railway. A pressure of 2½ lbs. is maintained in the acetylene pipe line.

*Advantages of This System.*—This system of generating oxygen and acetylene gives a constant supply of the gases at a constant and at the same time a minimum pressure. The great advantage is that there are no interruptions in the pressure due to shutting down the plant when a fresh charge is put in. It is also unnecessary to buy and maintain expensive high pressure receivers and fittings. There are no fluctuations due to recharging, as the plant is absolutely continuous in its operation. A sufficient stock of the necessary ingredients can be kept on hand to cover any emergency so that there is no danger of the stoppage of the plant which might result if the gases were purchased from a manufacturing company.

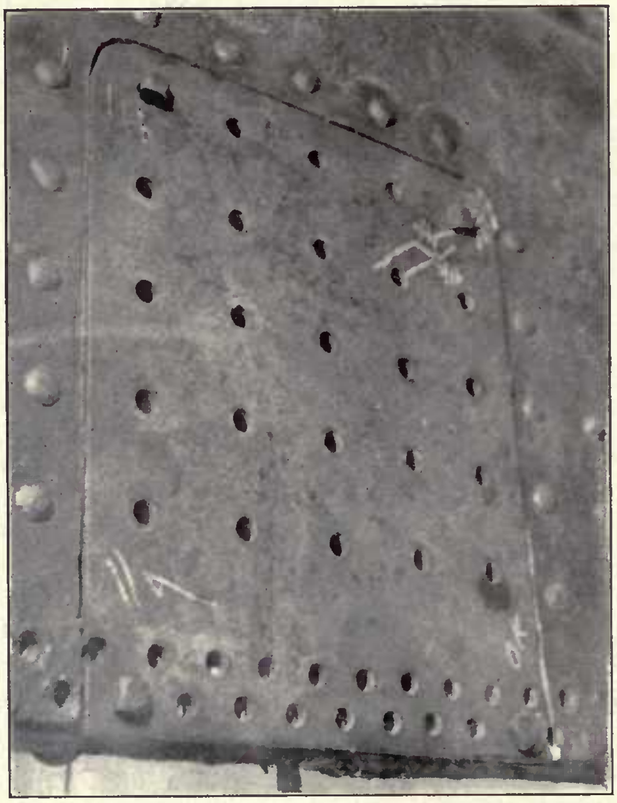


**Fig. 414—Defective Part of Sheet Removed and Patch Fitted in Place.**

*Shop Plant.*—The plant above referred to generates about 2,000 cu. ft. of oxygen per 10-hour day, at a cost of 2 cents per cu. ft. This is less than one-half the cost if purchased in drums from a manufacturing company. This supply is sufficient to operate four burners, which makes the cost 98 cents per burner per hour, including material, labor and the expense of compressing the gas. The cost of the acetylene is 13 cents per burner per hour, thus making the total cost of the gases $1.11 per burner per hour.

The burner or blow pipe is connected to the oxygen and acetylene pipe lines by means of rubber tubes, as shown in Fig. 407. Between the opening in the oxygen pipe line and the rubber tube which connects with the oxygen pipe of the burner or blowpipe, is placed a pressure reducing valve by means of which the blowpipe operator can readily vary the pressure of oxygen in the burner, and which, when once adjusted to deliver gas at any desired pressure, will automatically maintain that pressure in the discharge line regardless of variations in the pipe line pressure. A pressure of about 10 lbs. has been found to give the best results in the burner.

*Burners.*—There are two general styles of burners used in connection with the oxy-acetylene welding process, one, as shown in Fig. 408, for work in a horizontal position, and the other, as shown in Fig. 410, for work in a vertical position. The burner receives the acetylene gas from the main pipe line through a combined flash back trap and water column pressure indicator. The flash back trap operates in such a way as to prevent the oxygen from backing up into the acetylene line, or any pressure in excess of 3 lbs. from accumulating in any part of the acetylene system.

*Development of the Oxy-Acetylene Method.*—The oxy-acetylene method of welding is a trade in itself and can only be mastered by gradual development. This must be carried on in an intelligent and thorough manner, and in such a way that the workman can see and know the result of his work. It is impossible to see the water side of the weld in a firebox, and we must depend on the skill of the workman in making a perfect weld. To train the workmen so that they may know the result of their work, they are provided with test pieces which are welded together and then pulled in a testing machine, which shows them the exact condition of the weld.

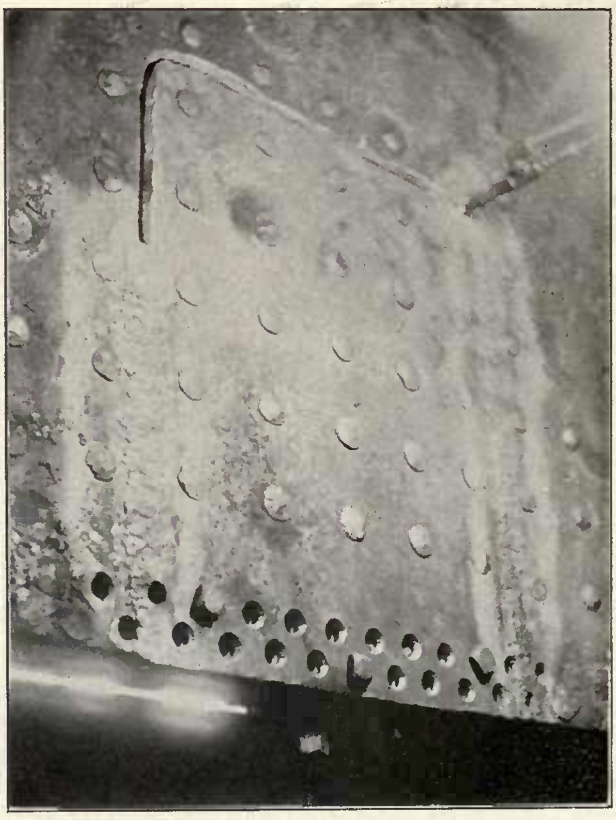


**Fig. 415—Patch Partially Welded, Showing Burner in Operation.**

The oxy-acetylene process of welding is adapted to wide application in railway shops and its use is being extended every day. One of the first jobs performed at

Topeka was the welding of tubes in a Jacobs superheater. This has proved so satisfactory that in the past year over 20,000 tube ends have been welded with excellent results. Fig. 409 shows the tubes being welded in a superheater for a tandem compound locomotive. The butt joint in the wrapper sheet has also been welded. This was done before the joint was riveted.

*Welding of Boiler Tubes.*—Boiler tubes have been welded in the flue sheet for a locomotive boiler with the Jacobs-Shupert firebox, as shown in Fig. 411. This is undoubtedly an innovation, but the excellent results obtained from welding superheater tubes have shown that it is not only entirely feasible for welding boiler tubes in the sheet, but will mean an immense saving in the course of a year in the repairs of flue leakages. The actual cost of removing, repairing and replacing 2-in. boiler flues by the usual method of rolling and beading compared to

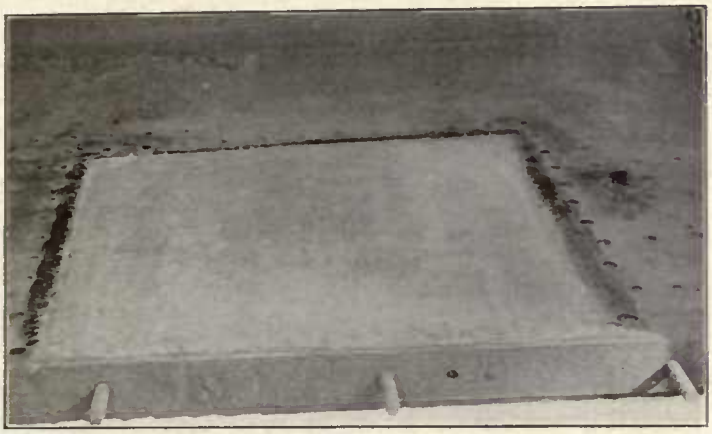


Fig. 416—Patch Welded in Firebox.

the cost of welding flues by the oxy-acetylene process is as follows:

| | Per 100 Rolling and beading. | Per 100 Oxy-acetylene. welding. |
|---|---|---|
| Remove complete | $2.640 | $2.640 |
| Clean | .105 | .105 |
| Cut for safe end | .525 | .525 |
| Cut to length | .315 | .315 |
| Spliced or scarfed | .335 | .335 |
| Weld (safe end) | .560 | 560 |
| Swedge | .210 | .210 |
| Anneal | .030 | .030 |
| Make safe ends | .210 | .210 |
| File holes | .100 | .100 |
| Apply copper ferrules | .430 | .... |
| Cost of copper ferrules | 2.720 | .... |
| Measure for length | .220 | .220 |
| Apply and set | .890 | .890 |
| Expand, roll and bead | 1.540 | .... |
| Roll and pin | .... | .750 |
| Oxy-acetylene weld | .... | 4.500 |
| Roll and shim front end | .600 | .600 |
| Test | .325 | .325 |
| Totals | $11.725 | $12.325 |

The actual cost by the welding process is about 5 per cent. higher than the usual method of rolling and expanding, but the life of the tubes is extended almost indefinitely, or at least until they must be removed for some other cause than leaking at the tube sheet joint. The above cost is for welding when the tubes are in a horizontal position. The welding cost is reduced about one-half when the tubes are placed in a vertical position, such as welding the superheater tubes as shown in Fig. 409. Sample tubes were welded into the sheet and pulled in a testing machine and compared with the usual method of rolling and beading. The results of these tests are shown in Figs. 412 and 413. The welded tubes offered

Fig. 417—Patch Welded on Outside of Firebox.

an average resistance during the test of 34,330 lbs. as compared to 30,980 lbs, for the rolled and beaded tubes, or 10.8 per cent. in favor of the welded tubes. The photograph of the welded tube, Fig. 413, shows the weld was stronger than the tube, as the metal was ruptured and part of it left in the sheet.

In welding some parts it is advisable to pre-heat the metal in an ordinary forge, or with an oil burner. With a view of reducing the cost of welding tubes this was tried, but it was found that it so disorted the tube sheet

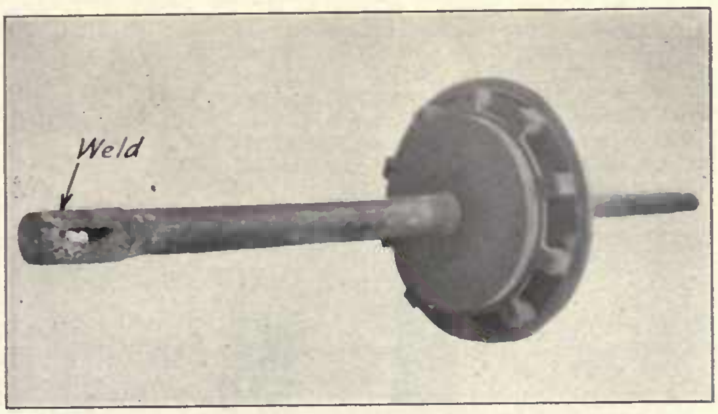



Fig. 418—Piston Rod Showing Metal Welded on End.

that nothing was gained by the practice and it was discontinued.

*Firebox Welding.*—This method has been successfully used in repairing locomotive fireboxes by welding in patches when it was impossible to repair the firebox in any other way. This has been done repeatedly, when it would otherwise have been necessary to put in a new firebox. Fig. 414 shows a patch in place ready to be welded and Fig. 415 shows the same patch in the process of being welded. Fig. 416 shows a large patch in a wide firebox locomotive. This patch has been in service about nine months and has given no trouble whatever. Patches are easily welded on the outside of fireboxes, as shown

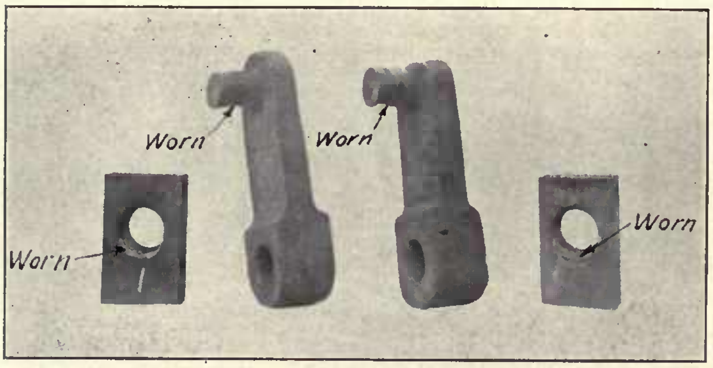



Fig. 419—Trailer Truck Hangers as Removed from Locomotive.

in Fig. 417. It is estimated that a saving in firebox renewals for a year will amount to over $35,000 in a shop which repairs locomotives at the rate of 30 per month.

The following tabulated statement shows a few examples of the savings that have been effected in fireboxes by the welding on of patches:

| No. | Operation. | Cost: Repair. | Cost: New part. |
|---|---|---|---|
| 1087 | Crack 18 in. long in door sheet and several cracks in tube sheet welded | $18.00 | ..... |
| | Door sheet and tube sheet saved.... | ..... | $172.00 |
| 1108 | Patch 15 x 15 in. on right side sheet.. | 75.00 | ..... |
| | " 12 x 22 in. on right side sheet.. | | |
| | " 12 x 14 in. on fire door sheet.. | | |
| | " 12 x 18 in. on fire door sheet.. | | |
| | Engine needed new firebox.......... | ..... | 800.00 |
| 2264 | Patch 12 in. high around entire firebox above mud ring.................. | 90.00 | ..... |
| | Engine needed new firebox.......... | ..... | 450.00 |
| 169 | Patch 26 x 24 in. on right side sheet, mud ring corners patched, several other small cracks on various parts of firebox....................... | 70.00 | ..... |
| | Engine needed new firebox........ | ..... | 470.00 |
| 604 | Patch 12 x 14 in. on both fire doors, several patches on side sheets, and mud ring corners patched......... | 65.00 | ..... |
| | Engine needed new firebox.......... | ..... | 700.00 |
| 345 | Two patches 24 x 48 in. on side sheets and several small cracks welded... | 80.00 | ..... |
| | Engine needed new firebox.......... | ..... | 530.00 |

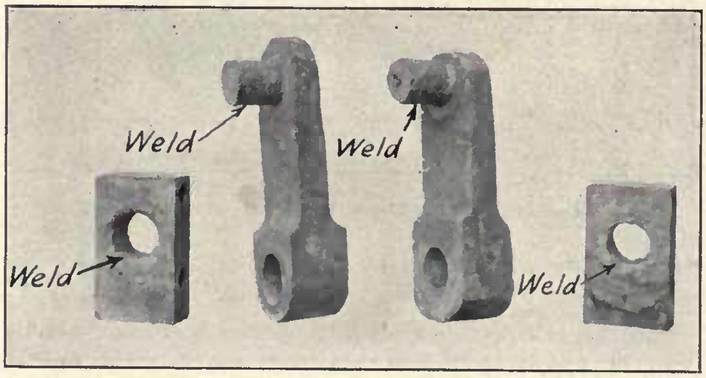



Fig. 420—Hangers Shown in Fig. 419 with Metal Welded On.

*Miscellaneous Welding.*—Locomotive parts are welded and saved at a trifling expense and made as good as new, when it would be impossible to repair the old part in any other way. The list of such parts is a long one, but a few of the more important ones are rocker arms, side

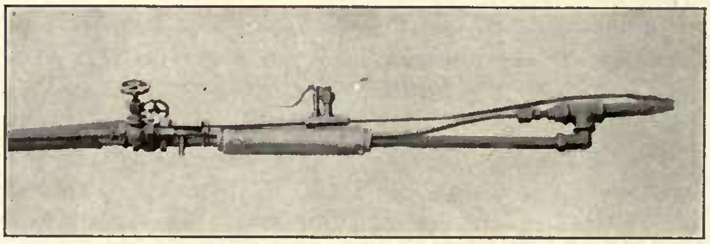


Fig. 421—Burner Used in Cutting.

rods, links, frame braces, eccentric blades, crossheads, piston rods, trailer hangers, valve stems, reverse lever quadrants, etc.

Fig. 418 shows a piston rod for a tandem compound locomotive that has had metal welded around the end which fits into the crosshead. This had become worn so that the rod could no longer be used. In this case the rod was put in a forge and preheated before the oxy-acetylene torch was applied. After about 1/8 in. of stock

Fig. 422—Oxy-Acetylene Torch Cutting Up Scrap Firebox.

had been added on, the rod was turned to fit the crosshead without disturbing the location of the key-way, and the crosshead was put on as it was originally. The actual costs were as follows:

| | |
|---|---|
| Labor welding on metal.................... | $0.38 |
| Oxygen and acetylene...................... | 1.67 |
| Labor turning taper....................... | 0.20 |
| Total .................................... | $2.25 |

The cost of a new rod is $15, which leaves a saving of $12.75 by the expenditure of $2.25.

Trailer truck bolster hangers are removed on account of the pins becoming badly worn, as shown in Fig. 419. It would cost nearly as much to repair them in the blacksmith shop as it would to make new ones, and after they were repaired in this way, they would require as much machining as new hangers. The metal that has been worn away on the pin or in the block is replaced by the oxy-acetylene torch, as shown by Fig. 420, and the cost of machining is small because the original centers are preserved.

*Cutting Burner.*—A special burner, Fig. 421, is used in the cutting process and consists of the usual burner with an additional oxygen pipe placed alongside. The tip of the pipe is pointed so as to direct the flow of oxygen toward the hottest part of the flame. The metal to be cut is first heated to the melting point by the regular burner, then the additional oxygen is turned on by pressing the spring valve.

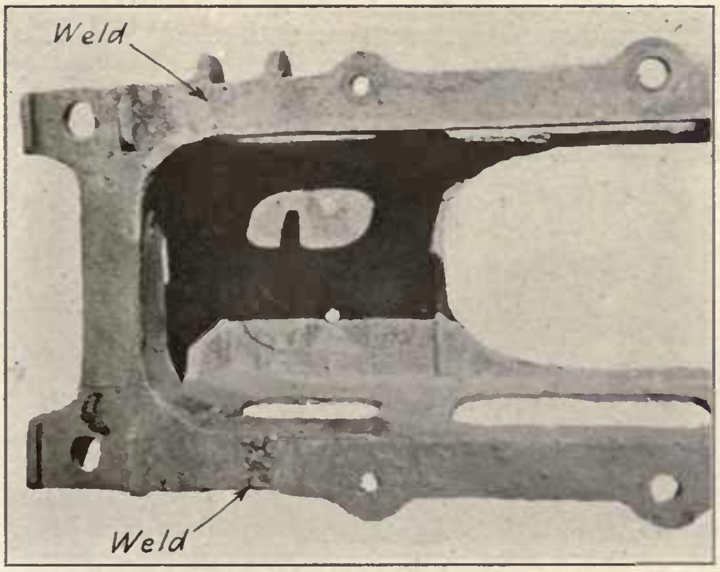



Fig. 423—Cracks Welded in Car Truck Bolster.

Scrap fireboxes are considered practically worthless unless they are cut up in sheets that can be put under the shears. The cost of handling and shipping fireboxes is about as much as they will bring when sold. The oxy-acetylene process has proved to be a money saver in cutting up fireboxes into sheets. An illustration of this method is shown in Fig. 422. The price of scrap steel in uncut fireboxes is $6.05 per ton, and the same firebox cut into sheets will bring $10.75 per ton, a difference of $4.70. The firebox shown in Fig. 422 weighs about two tons and the saving would therefore amount to $9.40 if it were cut up into sheets. The entire cost of cutting by the oxy-acetylene process would amount to about $3.50. The saving thus made is exclusive of the cost of handling and shipping.

*Car Truck Repairs.*—The use of the oxy-acetylene process has been confined entirely to the locomotive shop, wtih the exception of repairs to truck bolsters, which are collected and brought to the boiler shop where the necessary repairs are made. Often small cracks appear in the steel castings which, if allowed to spread, would soon cause a rupture. An illustration of a truck bolster that has been repaired and saved is shown in Fig. 423.

| | |
|---|---|
| The bolster cost new | $21.70 |
| Cost of welding | 1.50 |
| Saving | $20.20 |

*Comparative Tests of Electric and Oxy-Acetylene Welds.*—Tests were made of electric and oxy-acetylene welds to show the comparative strength. The electrically welded bars came from a locomotive manufacturing company, and the oxy-acetylene welds were made by the railway company. The results were as follows:

| Description. | Electric. | Oxy-acetylene. |
|---|---|---|
| Size of bar | 1¼ x ½ in. | 1⅛ x ½ in. |
| Tensile strength, lbs. per sq. in. | 37,600 | 48,100 |
| Elongation in 4 in., per cent | 2 | 4 |

These results show a decided advantage in favor of the oxy-acetylene process.

*Conclusions.*—The oxy-acetylene process of welding metals has now reached a practical stage of development and is worthy of a place in large manufacturing plants or railway shops. The equipment should be such that the gases are generated at a central plant and distributed in pipe lines to the various shops. A railway shop, overhauling 30 engines a month, should have a plant of sufficient size to generate 6,000 cu. ft. of oxygen per 10-hour day, which would be sufficient to operate 10 or 12 burners. If the oxygen were bought from a manufacturing company in drums containing 100 cu. ft. per drum, it would mean the handling of 60 drums a day, at a cost of more than double what it would cost in a central plant, aside from the inconvenience of handling so many drums.

There is no doubt but that a great saving can be made by the use of this process, and development should be along the lines of reducing the cost of manufacture of the gases for use in large central plants.—*H. W. Jacobs, Assistant Superintendent Motive Power, Atchison, Topeka & Santa Fe.*

NASHVILLE SHOPS; NASHVILLE, CHATTANOOGA & ST. LOUIS.

Side sheets can be successfully welded in a locomotive firebox in a comparatively short time and with very little trouble, if the work is properly done. Provision must be made for contraction when the weld cools off. The cutting of the opening for the patch in the firebox should


Fig. 424—Partial View of Patch About to Be Welded to the Side Sheet.

be done with a pneumatic hammer and not with the blowpipe, as in the latter case the steel will oxidize where it is cut and it will be difficult to make a successful weld. The sheet and the patch should be trimmed with a bevel such that when the patch is set up ready for welding the two sharp pointed edges will touch and an opening or V will appear leaving an angle of 45 deg. between the two edges of the sheets (Fig. 424). To allow for contraction of the patch a U should be formed near its edge, as shown in Figs. 424 and 425, and projecting on the same side as the open side of the V formed between the edges of the two sheets. This can be made on a press, or under

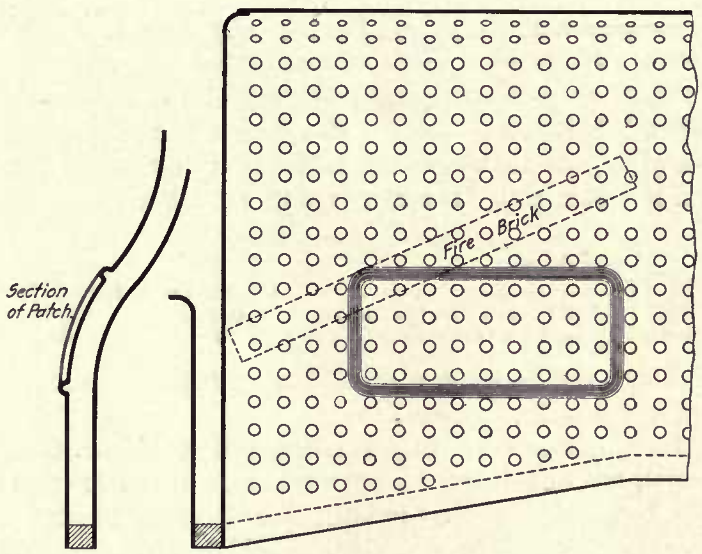



Fig. 425—Showing Patch Welded on Firebox Before U Was Hammered Down.

clamps or with a fuller. On a 5/16-in. sheet, for instance, the U depression should be about ½ in. deep with a radius of about ½ in. While the weld is cooling off the *U* should be hammered down with a pneumatic hammer. The *U* must, of course, project toward the fire side so that it may be hammered. In putting on a patch it is best to apply the staybolts before welding. Splendid results have been obtained in making a large number of welds in this way, some of them directly under the arch on high pressure boilers.

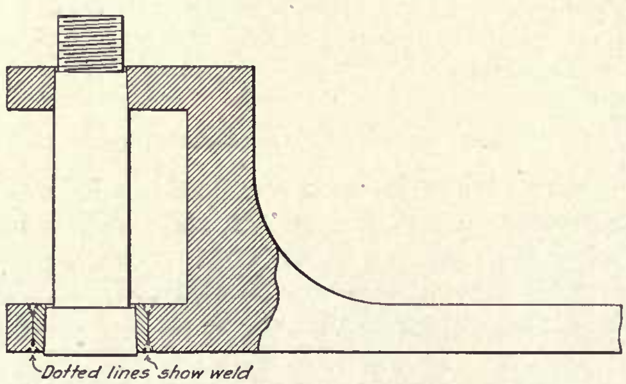



Fig. 426—End of Eccentric Blade Repaired by Oxy-Acetylene Welding.

The welding torch must be kept clean. If too much oxygen is used the metal will oxidize and will not weld. To get a perfect weld in applying a half side sheet form a *U* along the top of the sheet. In welding a fire door flange where the sheet is cracked in the knuckle of the flange, do not cut out any more of the door sheet than is necessary, keeping the weld as near the turn of the flange as possible, thus leaving it free to contract without putting much stress on the weld. If this cannot be done it will be necessary to use a *U*, as described above. It is good practice to hammer on the heel of the flange after welding.

Cracks develop in the firebox that can be welded perfectly and, again, there are cracks that cannot be welded satisfactorily. For instance, if a crack in the knuckle of the flange runs the long way of the flange, it can be cut with a diamond point chisel and a good weld can be made. If the crack is around the knuckle of the flange it is useless to try to weld it, as there is no way to provide for contraction, and nine times out of ten the weld will pull apart. Where the crack is in the center of a side sheet, we have never been able to make a successful weld; the first effort to weld a crack in a side sheet caused no end of trouble; the crack extended 12 in. from one staybolt to another, taking in three staybolts. It was cut out with a diamond point tool and apparently

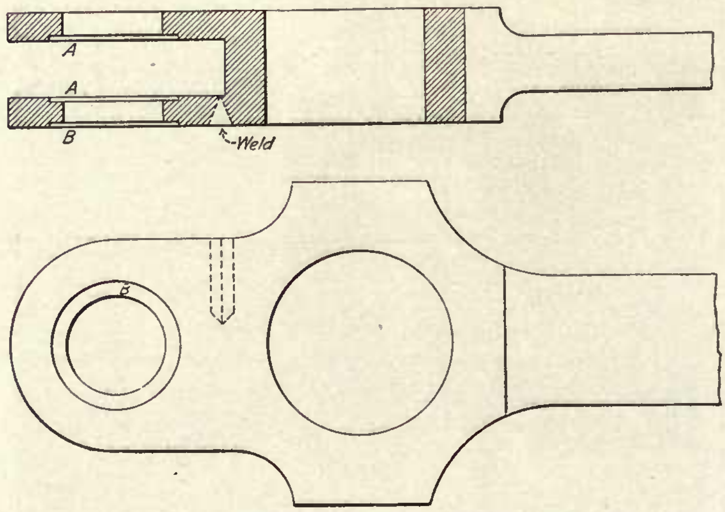



Fig. 427—Damaged Jaws on Rods Which May Be Repaired by Oxy-Acetylene Welding.

welded very satisfactorily, but after the weld cooled off it was found that the next row of staybolts had developed a similar crack—the contraction had pulled the sheet apart in the weakest place. The new crack was cut out and welded and after cooling a similar crack developed which opened 3/32 in. We continued to weld one crack after another until the first weld made had broken. We tried to weld it again but found it impossible to make a successful weld because of oxidization. We cut out the bad place in the sheet and applied a patch, which proved entirely satisfactory.

This process is not only convenient and reliable, but is economical for welding links, link lifters, link blades, intermediate ends on side rods, crossheads, driving boxes, reverse levers, quadrants, guide yokes, driving wheels, driving wheel tire flanges, Leeds couplers, channels on tank truck frames, lubricators and frame braces. For cutting purposes it cannot be excelled. When engines come into the roundhouse with badly cut eccentric blades at the pin hole, it is the practice to ream the hole out, countersinking it on both sides and to place a bushing in position, as shown in Fig. 426, and weld with the oxy-acetylene torch. The V's indicated by the dotted lines are 45 deg. and about ¼ in. deep. The hole is then reamed to standard size. Before we installed the oxy-

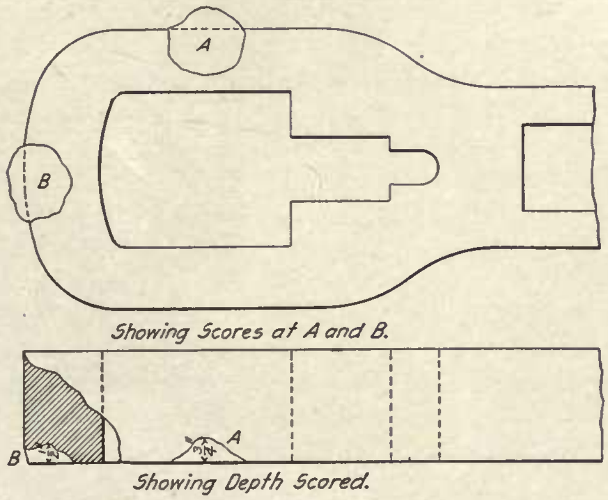



**Fig. 428—Scored Connecting Rod Repaired by Oxy-Acetylene Welding.**

acetylene plant it was necessary to apply a new end to the eccentric blade, which, under the best conditions, would consume eight to ten hours, whereas this work is now done in one hour.

We experienced trouble with our knuckle bushings and washers wearing into the rods, thereby weakening them. We now weld these worn places, restoring them to the original thickness. The jaws, in one case, were worn at *A* and *B* (Fig. 427) and cracked at the point indicated by the arrow. Rods scored, as shown in Fig. 428, are also easily repaired by welding on material.

The top of the flanges were cut on the tires of a derailed engine, as shown in Fig. 429. Under former practice it would necessitate reducing the tire ¾ in. in diameter. With the oxy-acetylene process the tire, which was practically new, was repaired and put in first class

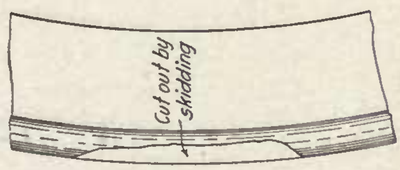



**Fig. 429—Steel Tire Cut by Skidding and Reclaimed by Oxy-Acetylene Welding.**

condition at a cost of $1. To have re-turned the tire, reducing it ¾ in. in diameter, would have cost $7.06, and in addition we would have lost ⅜ in. of tire wear. We reclaim any number of quadrants and latches by building up the worn teeth, thus effecting a large saving. On steel driving boxes where the cellar bolt wears the hole oblong we drill a larger size hole and countersink it. A plug is driven in and welded. The hole is then drilled to the original size. We build up reverse levers to proper size when they become worn from the latch. Where we find guide yokes cracked we chip out the crack and weld it with oxy-acetylene, thereby economizing in both labor and material. Front end couplers on locomotives crack in different places and are condemned by the inspectors. We weld these cracks successfully. We have likewise reclaimed a number of fractured channel beams. We have also welded tool holders, staybolt taps, shafts, carpenter chisels, bits, hammers, adz., and iron pipe, including branch pipes, dry pipes and air pipes of all sizes.

A piece of shafting 122 in. long and 4½ in. in diameter, used in connection with the hoisting engine of a yard crane, was badly worn, as indicated in Fig. 430. A new shaft would have cost $25. The shaft was turned down at the worn part and a sleeve was made with the inside diameter corresponding to the diameter

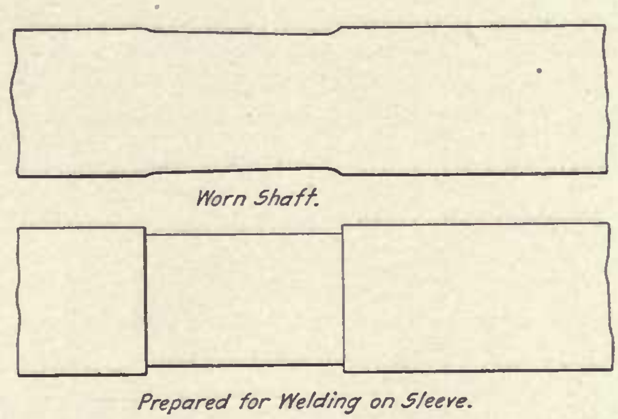



**Fig. 430—Worn Shaft Which Was Repaired by Oxy-Acetylene Welding.**

of the part turned down and the outside diameter to the full diameter of the shaft. The sleeve was cut to proper length to fit between the shoulders and then split in two halves and welded on the shaft. A little filing finished the job. The cost of repairs did not exceed $1.50. The success of the work lies in the skill of the operator, and this can only be acquired by practice and careful study.—*William G. Reyer, General Foreman, and R. W. Clark, Boiler Shop Foreman, Nashville, Chattanooga and St. Louis, Nashville, Tenn.*

### BUFFALO CAR SHOPS; ERIE RAILROAD.

In looking over the Erie car shops at Buffalo, N. Y., in search of labor and time saving methods and devices, the most striking feature encountered was the use of oxy-acetylene cutting apparatus in connection with the repairs to steel cars and the cutting off of the rivets connecting the coupler and coupler yoke. The center sills on steel hopper and gondola cars, especially the older equipment, are often cracked or broken near the bolster, and it is necessary to cut the sill off and splice on a new end. In doing this the practice on most roads is to drill a number of holes in the sill with a pneumatic drill and cut it off with a pneumatic chipping hammer. This is a rather difficult task, as it is hard to set the brace, or "old man," for the air drill, and after the holes are drilled it is not an easy matter to cut the sill, as the workman must work in an awkward position. With the portable oxy-acetylene apparatus it is a comparatively simple matter to cut the sill. The apparatus is placed alongside the car, and the operator can easily go under the car and direct the flame on a chalk mark showing where the sill is to be cut. A center sill cut in this manner is shown in Fig. 431. It was practically impossible to take a photograph while this operation was being performed, but the way in which the operator handles the torch is plainly shown in Fig. 432. A 12-in. or 14-in. channel, such as used for center sills, can be cut through in from two to two and a half minutes at a cost, including labor

Fig. 431—Steel Center Sill Cut with Oxy-Acetylene.

and material, of about one-sixth of what it would be by the method formerly employed and described above. This cost, however, presupposes that the oxy-acetylene apparatus is in more or less constant use and does not have to be specially prepared for each operation. Where it is only used occasionally the expense would, of course, be higher.

Even after the center sill is cut, where the car is equipped with a built-up bolster, the most difficult part of the job remains, and that is cutting the rivets which connect the center sill to the bolster. These rivets are difficult to get at and it is a tedious job to remove them

Fig. 432—Cutting a Steel Channel with an Oxy-Acetylene Torch.

by ordinary methods. With the oxy-acetylene apparatus the rivet heads can easily be cut off in a very short time. At first thought it would seem impossible to cut off the rivet by melting through the head without injuring the sheet, but that it may be done without doing so is indicated by Fig. 433, which shows two ⅝-in. rivets whose heads have been cut off. The molten metal, which is blown to one side by the force of the flame, has

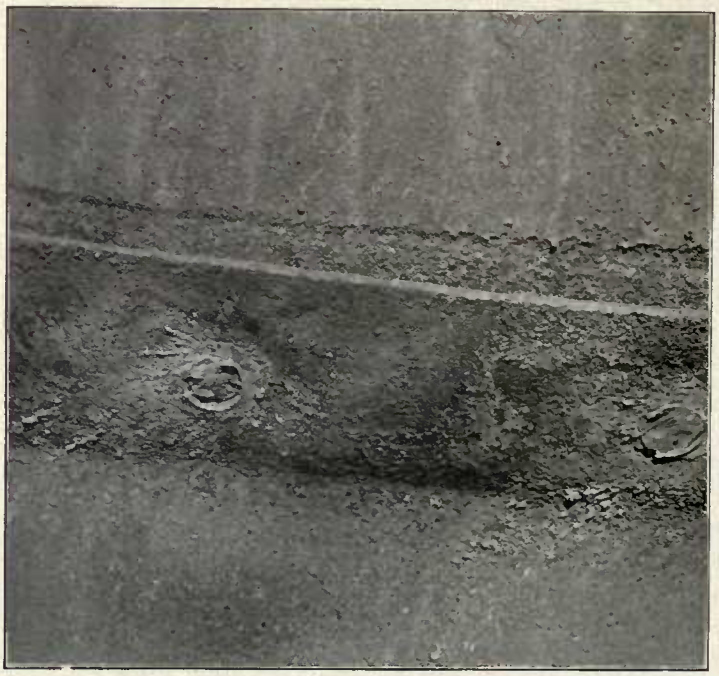


Fig. 433—Rivet Heads Are Cut Off Flush, but the Plate is Not Injured by the Oxy-Acetylene Flame.

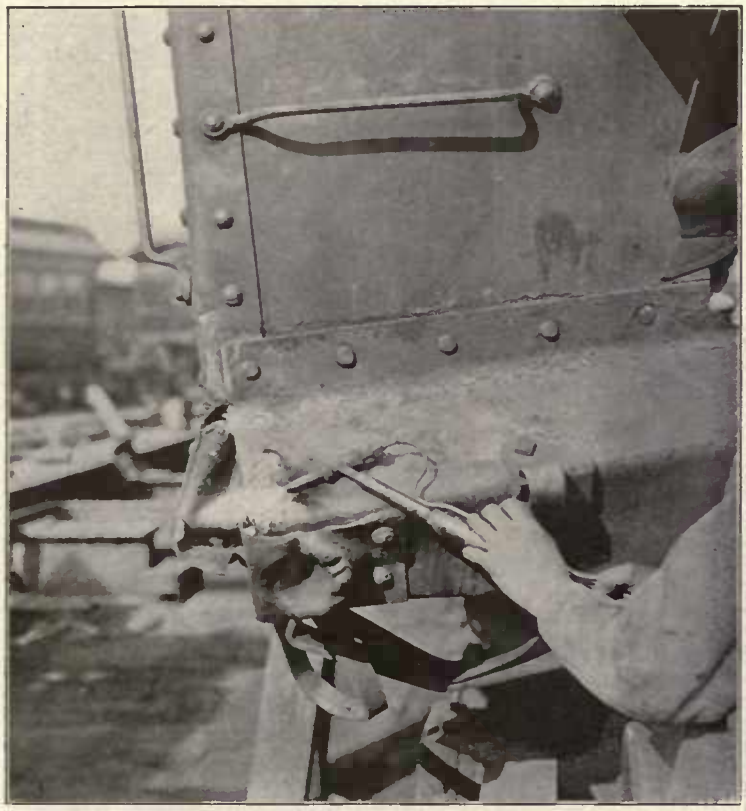


Fig. 434—Cutting Off Rivet Heads on End of Steel Car.

adhered to the sheet as shown, but the sheet itself is not touched.

The operator is shown cutting off a rivet head on the end of a steel car in Fig. 434. It is probably as quick and as cheap to cut off such rivets with a cold chisel and sledge as to do it with oxy-acetylene, and these rivets are usually cut off in that way unless the oxy-acetylene apparatus happens to be handy. However, the chisel bar method requires two men as against one with the cutting apparatus, and there is no danger of flying rivet heads injuring passers-by with the latter method. Unknown to the operator, the writer timed him while he was cutting off five of the rivet heads. It took less than two minutes.

Fig. 435—Cutting off Rivet Head on Coupler Yoke with Oxy-Acetylene Torch.

The easy and cheap removal of coupler yokes from damaged couplers has been a difficult problem to solve. Many devices have been designed for this purpose, but some of them have gone to the scrap heap and a large

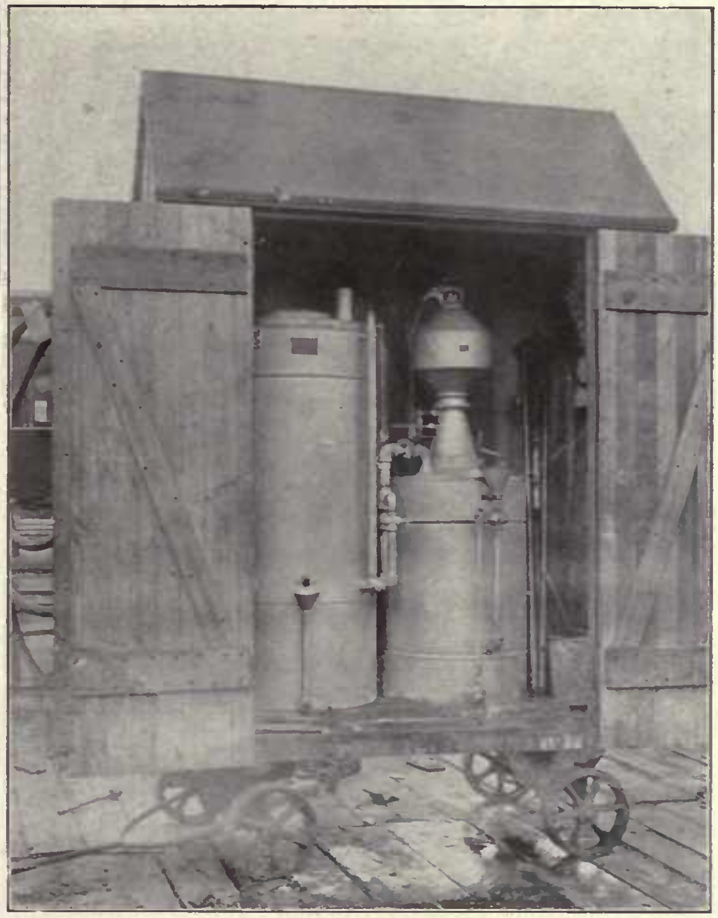


Fig. 436—Acetylene Generator Mounted on a Truck.

percentage of the remaining ones are not giving the best of satisfaction. From the results that are being gained at the Buffalo shops it would appear that the oxy-acetylene apparatus offers a most satisfactory solution of the problem. To illustrate its adaptability for this purpose a little demonstration was made. Three couplers were stood on their heads. The rivet heads on the first yoke were very large and square (Fig. 435) and it required 1¼ minutes for cutting off each head. On the other two yokes the heads were of the ordinary size for a 1⅛-in. rivet and required an average time of only five-eighths of a minute per rivet. The six rivet heads on the three coupler yokes were thus cut off by one man in five minutes.

A general view of that part of the machine that is used for generating the acetylene, and which is carried on a truck, is shown in Fig. 436. It is a comparatively simple matter to charge this generator. It was designed for stationary use but was placed on a truck by the railway company to make it portable. The manufacturer now makes a portable outfit which is more conveniently and compactly arranged. The rest of the apparatus is shown in Fig. 437. The vessel or tube, which is supported by the tripod, is filled with water and the acetylene gas passes through it; all danger of air backing up into the generator or of back fire is thus eliminated. The oxygen is contained in small tanks, as shown at the right. These tanks are filled by the manufacturer and contain 100 cu. ft. of oxygen under 1,800 lbs. pressure per square inch. The oxygen is mixed with the acetylene and ignited, the burner for this purpose being shown in the illustration. This particular apparatus was furnished by the Linde Air Products Co., of Buffalo.

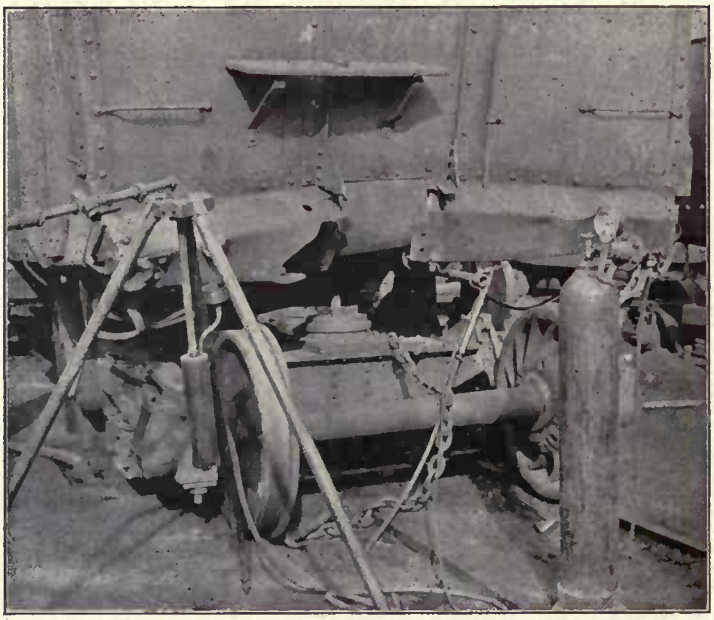


**Fig. 437—Oxygen Tank, Torch, Etc., Used with Oxy-Acetylene Cutting Apparatus.**

OXY-ACETYLENE WELDING IN STEEL PASSENGER CAR CONSTRUCTION.

Oxy-acetylene welding is being used to splendid advantage in the building of steel passenger cars for making strong, and at the same time invisible joints, which have an efficiency of from 80 to 85 per cent. The great strength of the riveted joint has made it a favorite for many locations on the steel car. But even where the rivets are countersunk and the heads are filed or ground flush it is not an invisible one. Soldering is sometimes used, and at times with success. There are, however, two objections to it; it is weak, having only about 40 or 45 per cent. of the strength of the metal united, and it has a different co-efficient of expansion from that of steel.

On the coaches for one road the joints of the roof plates are closed by the oxy-acetylene torch. The roof joints on a standard car total about 232 lineal feet. The principal joints are transverse, extending clear across. At either end of the car is a longitudinal joint several feet in length where the right and left hood plates meet. The metal of the roof is 1/16 in. or 3/32 in. thick. A difficulty that has been met in such work is a tendency of the plates to bend downward and form a groove with the joint at the bottom. This tendency is successfully dealt with by using a small T-bar, to the arms of which the edges of the plates are riveted. The web of the T lies immediately underneath the joint. The T-bar so increases the capacity for the absorption of heat that a heavy wire, ⅛ inch thick, is employed as a welding stick. A flat rate of 4 cents per lineal foot is paid for the labor; the gas expense is estimated at about 1½ cents per ft. The welding of the entire roof thus costs about $12.75. It is not necessary to chamfer the edges in butt-welding such thin sheets. The roof plates are about 7 ft. across. The T-bars have a metal thickness of ⅛ in.; the arms are about 1 in. wide, and the web about 1½ in. deep. The acetylene is supplied through flexible tubing from an overhead ¾-in. pipe.

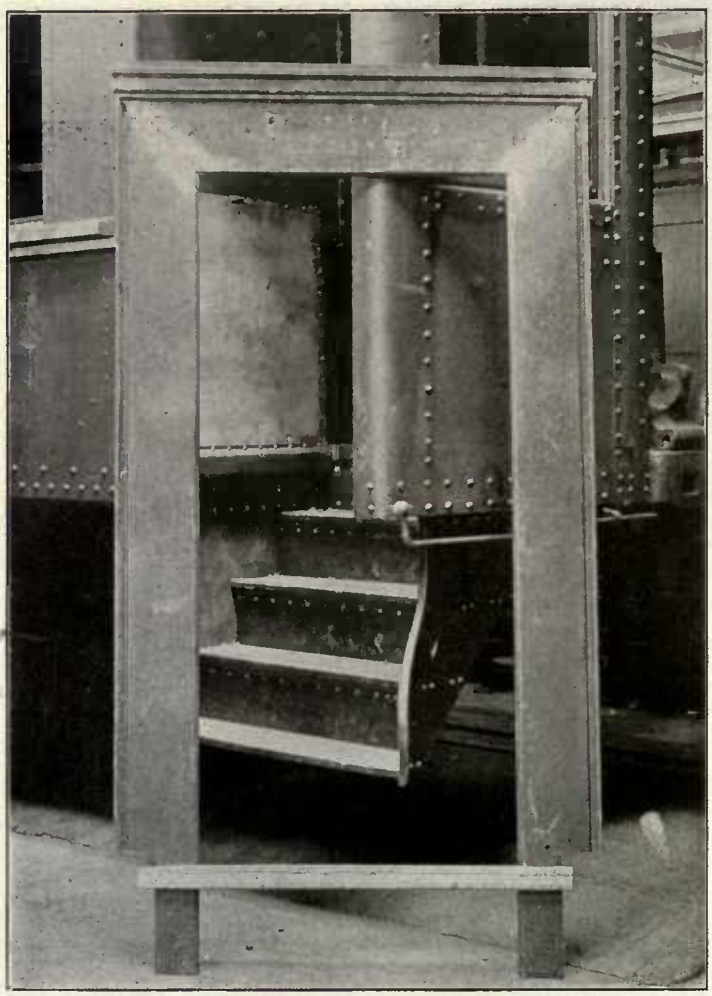


**Fig. 438—Door Frame for Steel Coach Made in One Piece by Oxy-Acetylene Welding.**

Another example of welding relates to the joints of the panel frieze. This is a flat, longitudinal panel with a molding above and below. There are three sections on one side of a car. The pieces are straight, but the joints must be such that there will be a difference when in place of ⅜ in. between the level of the center and the ends, which are 60 ft. apart, to provide the proper camber. Formerly, soldering was employed. It was, however, quite expensive, costing about $9 per car, and is not so satisfactory because of the weakness of the joint. By the oxy-acetylene process, the work is being done for $4.50 and makes a much better job. The plates are 1/16 in. thick. In making the weld, work is begun at a point distant one-third of the total width from the side which is to be uppermost when the frieze is in final position. Beginning at this point, the upper third is welded. The camber will now be in the wrong direction. However, by beginning at the same point as before and welding the remaining two-thirds, this camber is eliminated and the correct one introduced. There are no supporting

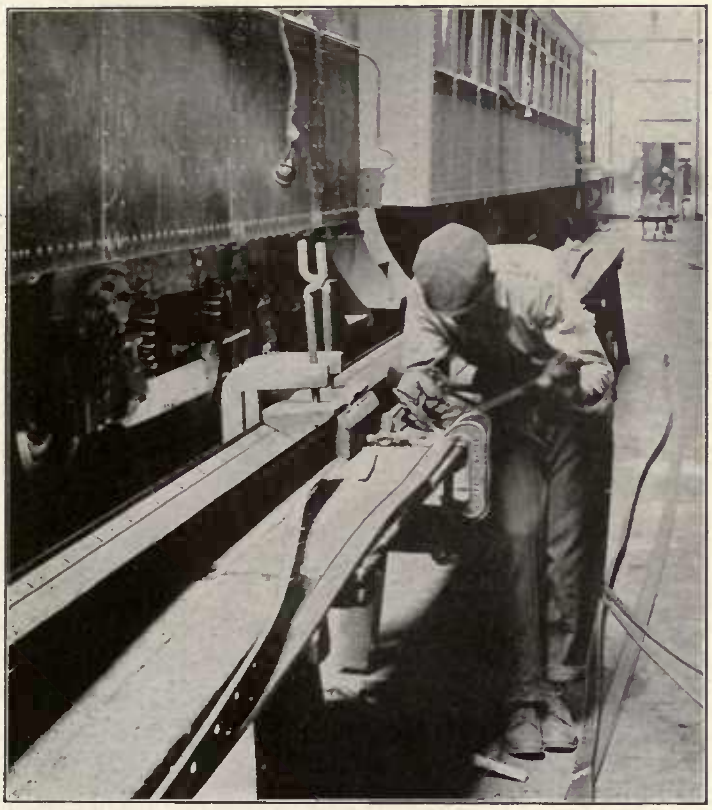


**Fig. 439—Welding Parts of Deck Molding Together; Eight Welds Per Car.**

strips riveted to the frieze, the plates being held together by the weld alone. So perfectly is the joint made and the excess metal removed that it would require considerable examination to find the joints in the finished car.

Another interesting piece of work is the joints of door frames. It is necessary that this shall be a perfect piece of work, but it is easily and satisfactorily done by the oxy-acetylene process, as shown in Fig. 438.

Ten door-headers for five cars were each made ⅜ in. too narrow. The old remedy would have been to tear out the frames, involving an expense estimated at $5 per door. However, a strip was successfully welded on, correcting the defect. The cost of welding and subsequent filing was estimated at 20 cents per door.

The diamond shaped window frames used on some coaches are made of 3/32-in. plate, and have four mortised joints each. Oxy-acetylene welding is employed for this purpose and similar joints in the rectangular deck frames are also welded by the same process. In a single car, there are upwards of 176 such joints, or about 30 lineal feet of welding.

Another example of the employment of welding as a finishing procedure is in connection with the grab handles. These consist of three parts, a steel tube and two fittings. The fitting when in position has a vertical projection which is enveloped by the tube end. A counter-sunk pin is employed to hold the two firmly together. The welding process is used to efface the joint where the end of the tube comes in contact with the shoulder on the fitting. The labor cost of setting and welding these fittings is 1½ cents each, or 3 cents for each grab handle.

On certain cars, the roof sheets and the steel head lining are about 1⅞ in. apart, along the top of the roof. There are ten chandeliers per car, and the double covering made of thin material has to be strengthened at ten points. This is accomplished by inserting a box-like support in two sections in the space between the head lining and the roof at each chandelier. Each of the twenty pieces is a rather complicated sheet metal form. The upper and lower bases are shaped somewhat like the letter C in Gothic type, only they are not precisely duplicates. These are connected by a strip between the convex sides of the C's. Formerly this entire piece was formed by pressing. There were, however, a large percentage of failures through radial cracks at the bends of the C's. Moreover, it required six operations on the press. At the present time, these pieces are formed of three pieces of 3/32-in. sheeting welded together by the oxy-acetylene process. It is estimated that a saving of 50 per cent. has been accomplished by the change in method, and there are practically no failures.

In some steel cars there is a recess or alcove for the water cooler. At the bottom of the alcove, a somewhat complicated depression is made for the reception of the drinking glass. It seems to be practically impossible to form this bottom together with the depression from one piece by the use of the press. The oxy-acetylene welding process permits the pressed piece and the bottom to be united into a single piece. The bottom is also welded to the vertical part of the alcove.

Perhaps the most interesting piece of work being performed in steel car construction is the welding together of sheets to form units of head lining. The units required are about 7 ft. square. The requirements call for the use of patent level stock. Apparently this is the only steel sheeting that is absolutely flat; but it is not obtainable of sufficient width. By the use of the oxy-acetylene welding process, two strips are so united, edge to edge, that a piece of the desired width is produced without destroying the required flatness. The stock used is quite thin (about 1/16 in. thick) and no reinforcing strip is employed. It is a butt weld. In carrying out the operation, the two half-sheets are secured edge to edge on a suitable table by heavy bars properly clamped. The edges of the sheets are not prepared, but are placed in contact on one sides and perhaps ¾-in. apart on the other. The operator begins on the side where there is contact, using a No. 4 tip and 1/16-in. wire. At first, the separation of the edges opposite tends to increase. But as the work advances, they press towards each other. Two or three times during the operation the clamps on the open side are loosened and the edges permitted to approach a little. As the operator works across the 82-in. seam, a buckle follows. But this disappears as he finishes the weld. The ends of the lengths which have been joined may not form a line that is quite straight, but this is readily corrected by trimming. The surface of the weld will not be smooth, and this is remedied by filing. The expense for the labor, including the filing, is 4 cents per lineal foot. The gas expense may be taken at 1½ cents, so that the weld costs, altogether, about 38.5 cents. The major portion of the welding aparatus used in the shop in which these operations were performed was obtained from the Davis-Bournonville Company.

# Blacksmith Shop Kinks; Locomotive Department

ASH PAN HOES.

Dies for welding the blades on ash pan hoes are shown in Figs. 440 and 441. Die *A* is cut away to the depth of the hoe blade and is grooved to conform to the rods used. Die *B* is cut to the depth of one-half the diameter of the rod and is grooved to match *A*. The face of plunger *C* is made the full width and length of the hoe blade, and is grooved with a radius of 13/16 in., which is one-half the diameter of the rod plus the thick-

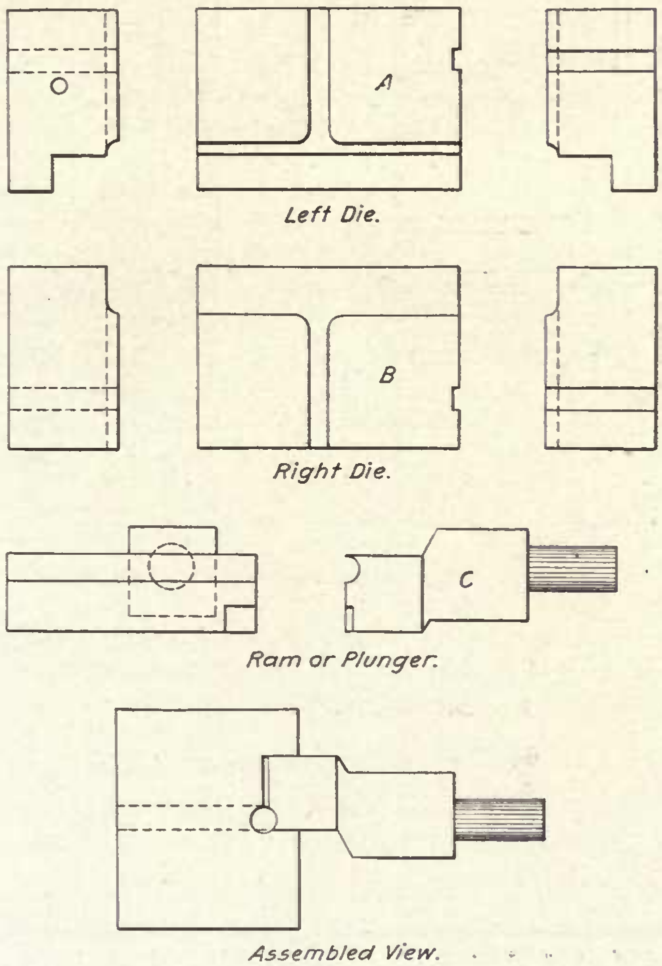



**Fig. 440—Dies for Welding Blades on Ash Pan Hoes.**

ness of the hoe blade. The groove laps the blade half way around the hoe back, making a strong and neat looking weld. The dies are used in a 2½-in. bolt machine. Before using these dies a cross-rod must be welded to the end of the handle similar to that used for the clinker rakes, the same dies, Figs. 452 and 453, being used. After the desired number of crosspieces have been welded to the handles the dies are replaced in the machine by those for welding on the hoe blade. The rods used are 1-in. round iron taken from scrap and the blades are cut from scrap boiler plate. One hundred and fifty of these hoes may be welded in nine hours. The eyes in the handles are bent in an eye-bolt machine.

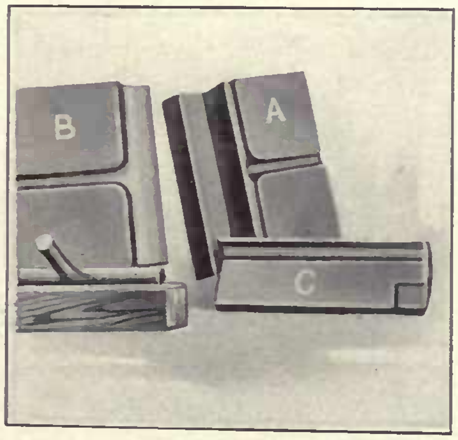



**Fig. 441—Dies for Welding Blades on Ash Pan Hoes.**

—*W. H. Fetner, Master Mechanic, and C. L. Dickert, General Foreman, Central of Georgia, Macon, Ga.*

BULLDOZER FOR LIGHT WORK.

While no air press that has come under my observation can successfully compete with the modern manufactured machines, they do help materially in increasing the output and making it of a uniform quality; the cheapness in building an air press, as compared with the price of a modern forging machine, is the principal thing that furnishes an argument in its favor. Such an air press is shown in Figs. 442 and 443. This I have re-

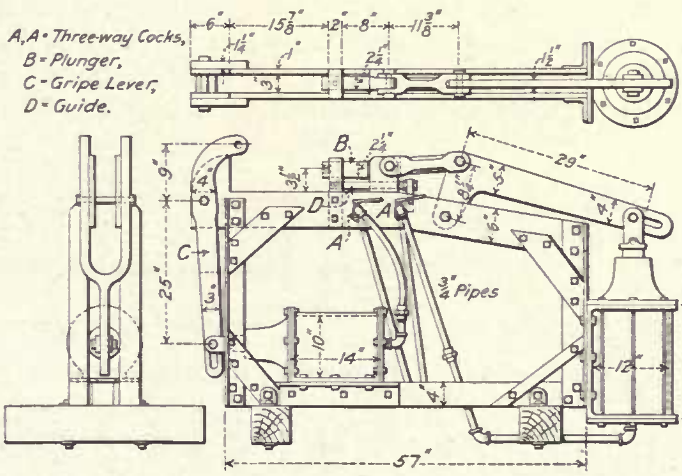



**Fig. 442—Air Press for Bolt Work and Light Forging.**

cently made, and on some work it will compete with a forging machine or bolt header; as a general proposition, however, it will not. It was built partly during spare time, partly with stolen time, and chiefly from scrap material. With an air pressure of about 100 lbs. we have an approximate pressure on the grip or vise of 21,500 lbs., and a pressure from the main cylinder or plunger of approximately 40,000 lbs. The dimensions given furnish 4½ in. travel to the plunger, which so far has proven to be sufficient. This press has been of so much assistance that I am seriously contemplating building a larger one, to be used only on large work, as doing small work on a large machine would be an ex-

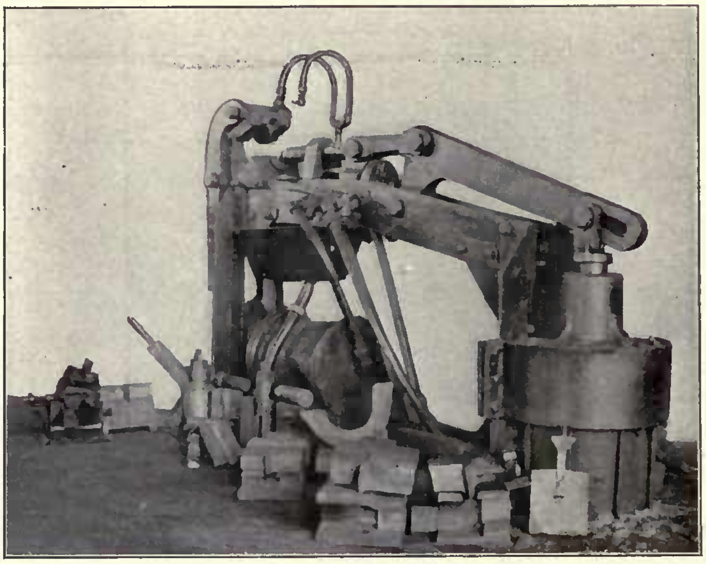


**Fig. 443—Air Press for Light Forging.**

travagant waste of air. As may be seen from both the sketch and the photo, there is plenty of room for improvement or changes.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

### BENDING RIGHT ANGLES, MACHINE FOR.

In using the machine for bending right angles, shown in Fig. 444, the material is heated at the point where it is desired to make the bend, and is then placed in the slot *G* in a vertical position and clamped. The 8-in. by 10-in. air cylinder actuates the arms *A* through the rods *R* at each side of the machine, which are 1 in. in diameter. The arms or levers *A* are keyed to the heavy casting *B*, which moves far enough to bend the iron, which projects above the slot *G*, down to the table *E*, thus forming a right angle. The frame of the machine is constructed of steel plates, castings and forgings, as

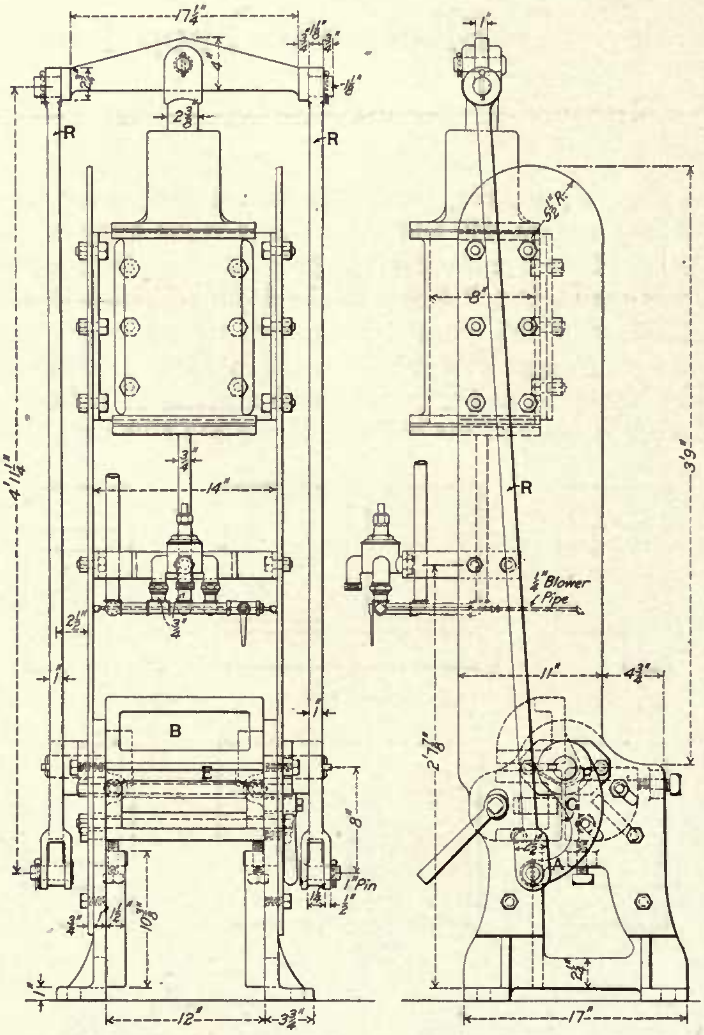



**Fig. 444—Machine for Bending Right Angles.**

shown. Iron up to 5-in. x 1¼-in. in section may be bent in this machine.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### BULLDOZER, PORTABLE.

The portable bending and upsetting machine shown in Fig. 445 has for its base a 12-in. x 4½-in. I-beam,

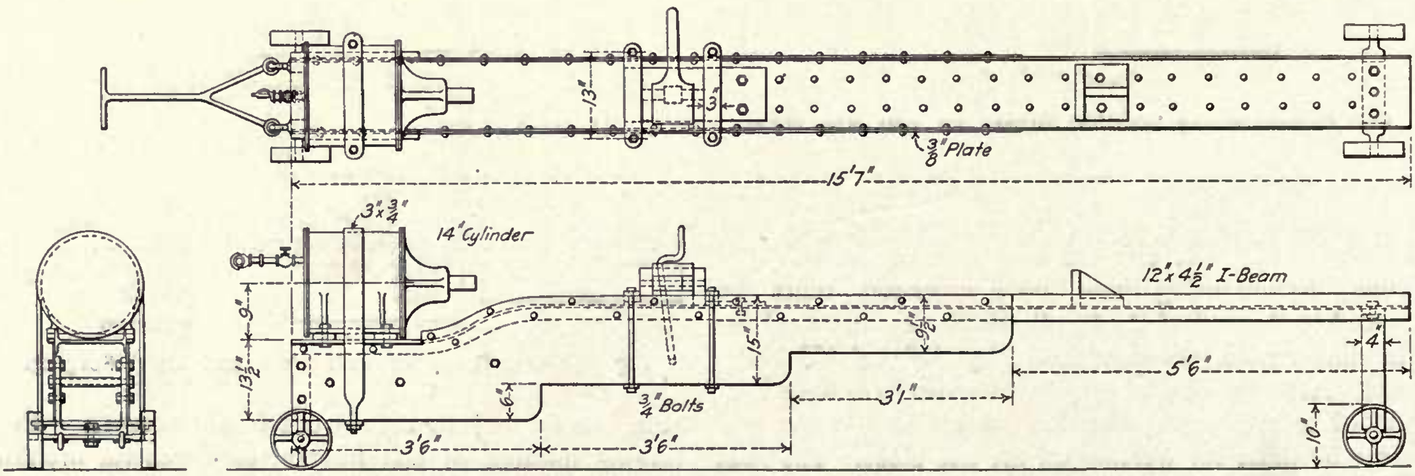



**Fig. 445—Portable Bending and Upsetting Machine.**

which is reinforced at the sides on one end by ⅜-in. steel plates. The 14-in. air cylinder is bolted and strapped to the bed, as shown. The machine is especially useful in the blacksmith shop for upsetting brake shafts, making brake hangers, bending uncoupling rods, etc. The adjustable hinged die near the middle of the machine is shown in detail in Fig. 446, and is used for holding the shaft at the point where it is to be upset to make the shaft large enough to form the square part on which the ratchet wheel fits. The square portion is

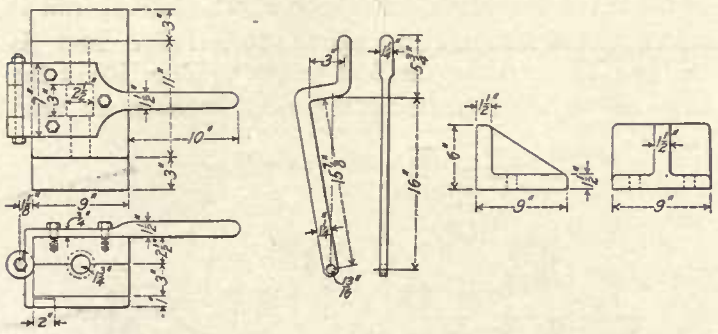


**Fig. 446—Hinged Die Used on the Portable Bending and Upsetting Machine.**

formed under a steam hammer or in a bulldozer. The bracket or stop near the other end of the machine is used for backing up the stock that is to be bent, and may be adjusted for various lengths of work by using the different sets of holes in the web of the I-beam. The machine was originally built for brake shaft work, but was afterwards modified to do the other classes of work mentioned above.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

CLAW BAR, DIES FOR.

A tool for making claw bars under a steam hammer is shown in Fig. 447. It consists of male and female dies, to which the spring steel handle is welded. The steel for the claw bar is first drawn to the desired shape, after which it is placed between the dies at *C*. This form completed, the metal is placed between the dies at *D* and is punched and cut off in one operation.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

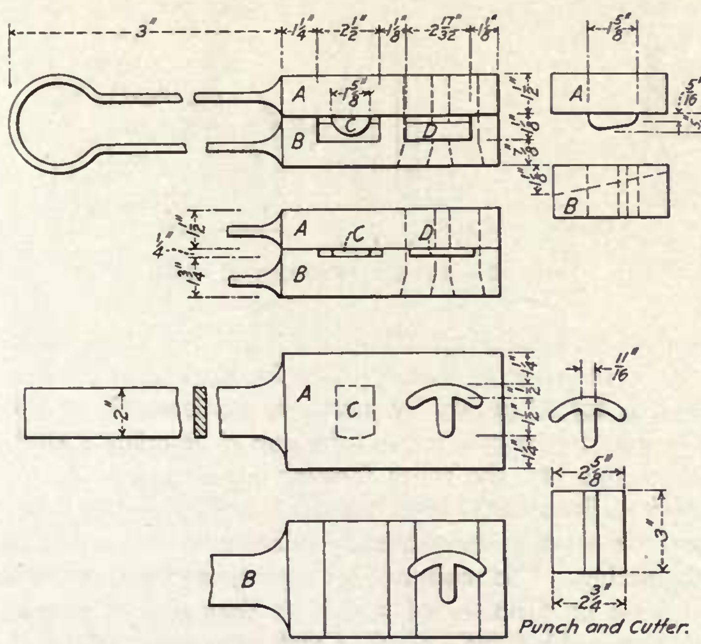



**Fig. 447—Steam Hammer Claw Bar Tool.**

CUTTING STEEL BARS UNDER STEAM HAMMER.

A device for cutting iron and steel bars which are too heavy for the light and medium size shears which are found in many of the smaller repair shops is shown in Fig. 448, and is used under a steam hammer. It consists of three parts, which are held togther by the ⅞-in. bolt, and the steel knife, *K*. The device illustrated is

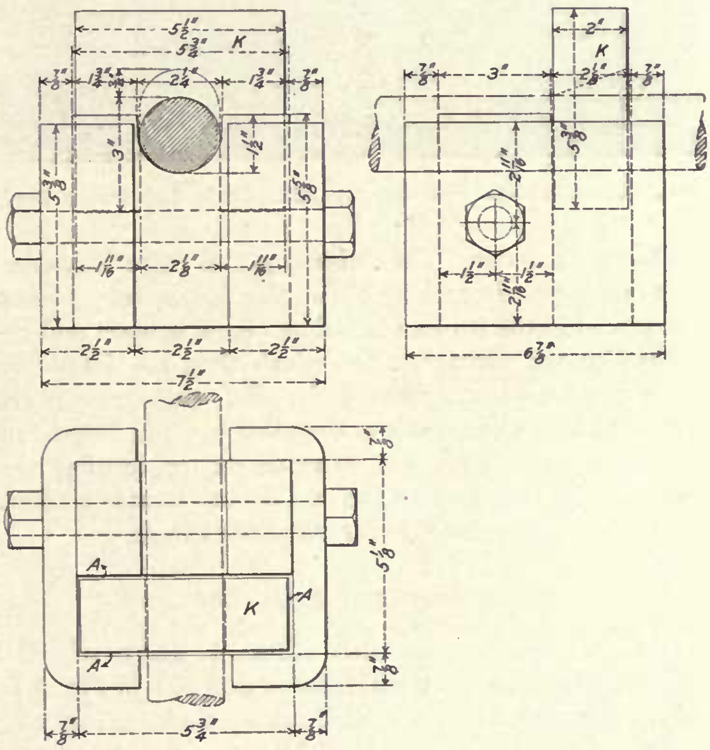


**Fig. 448—Dies for Cutting Steel Bars Under Steam Hammer.**

used for shearing 2-in. round bars. The block has a semi-circular channel of 1 1/16-in. radius, in which the bar rests. One blow of the hammer on the knife shears the bar. Similar blocks and knives are used for shearing 4 x ⅜-in. and 4 x ½-in. spring steel.—*H. P. Riley, Master Mechanic, United Railways of Havana, Cienaga, Cuba.*

CYLINDER COCK TOP PIECE.

The dies, plungers, etc., for making top pieces of locomotive cylinder cocks are shown at the right in Fig. 449 The stock, 1¼-in. round iron, is first upset, using the lower impressions and the right-hand plunger; it is then moved to the top impressions, where the hole is punched with the left-hand plunger.

Cylinder cock lower pieces are also made on this forging machine, and a great saving results, not alone in that iron is much cheaper than brass, but because there is not the loss by stealing, as is the case of the brass cocks. —*Long Island Railroad, Morris Park, N. Y.*

### INSULATING PIN DIES.

A pair of dies for making insulator pins, used on the high tension lines of the electric zone of the Long Island, is shown at the left in Fig. 449. The porcelain insulators are cemented to the end of the pin, the corrugations providing a permanent bond. The stock, ¾-in. round, is first partly upset in either the upper or lower impressions, then reheated and the corrugations formed in the center impressions. The finished pin in place illustrates this operation. In making these pins five pieces of stock are placed in the furnace at a time. Each is upset and returned to the furnace, after which they are forged to shape. Previous to making the dies, these pins were made by having a cast iron threaded bushing instead of the upset end. They can be made on the forging machine at less than half of the cost by the former method. —*Long Island Railroad, Morris Park Shops.*

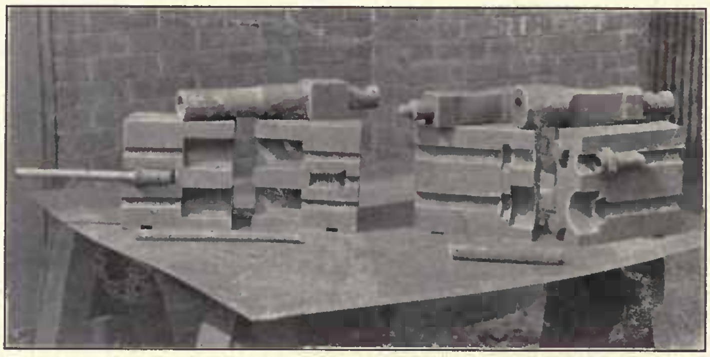


**Fig. 449—Insulator Pin and Cylinder Cock Top Piece Dies.**

### ECCENTRIC BLADE JAW DIES.

The dies used and the three successive stages of making the jaw ends of eccentric blades is shown in Fig. 450. These dies are used in a 3-in. machine and are of cast iron; the plunger is soft steel. Ranged along the top of the dies are three pieces, showing the stages of manufacture. The first shape is roughed out under a hammer. The second stage is that of punching the jaw. This is done on any forging machine, after which the jaws are spread sufficiently to allow the entrance of the plunger when put in the dies for the final operation. The chalk mark on the upper half of the jaw indicates that portion which is cut off just previous to the final heating. The dies, plunger and final shape explain the third operation, which is the result of a single blow.—*George W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

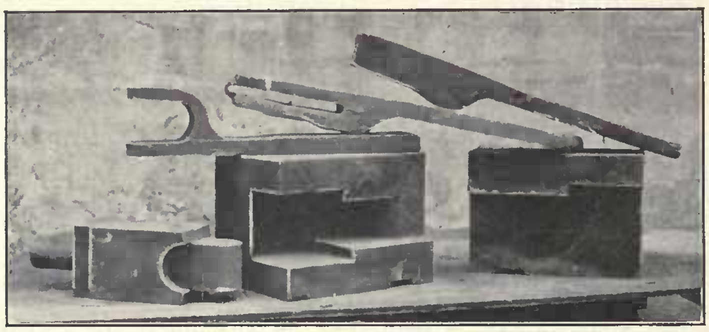


**Fig. 450—Eccentric Blade Jaw Dies.**

### EYE-BOLT BENDING MACHINE.

An air operated eye-bolt bending machine is shown in Fig. 451. The rack *P* is forced upward by the air cylinder *O*, thus revolving the arm *A*, on the end of which is a pin over which a roller, whose size depends on the size of the eye and the stock, is slipped. The heated iron is placed in the machine just above this roller and is clamped by operating the foot lever *B*. This forces the large pin upward clamping the stock between its head and an adjustable lug or stop above. A pin whose diameter is the same as that required for the eye of the eye-bolt, is forced inward by means of the lever *D*. Air is admitted to the cylinder and the arm *A* describes a circle about this pin, the roller forming a perfect eye on the stock. Pressure is then removed from the foot lever and the stock is automatically released by the action of the spring. The machine may be adjusted for any size eye-bolt or diameter of stock. It does not, of course, form a welded eye.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

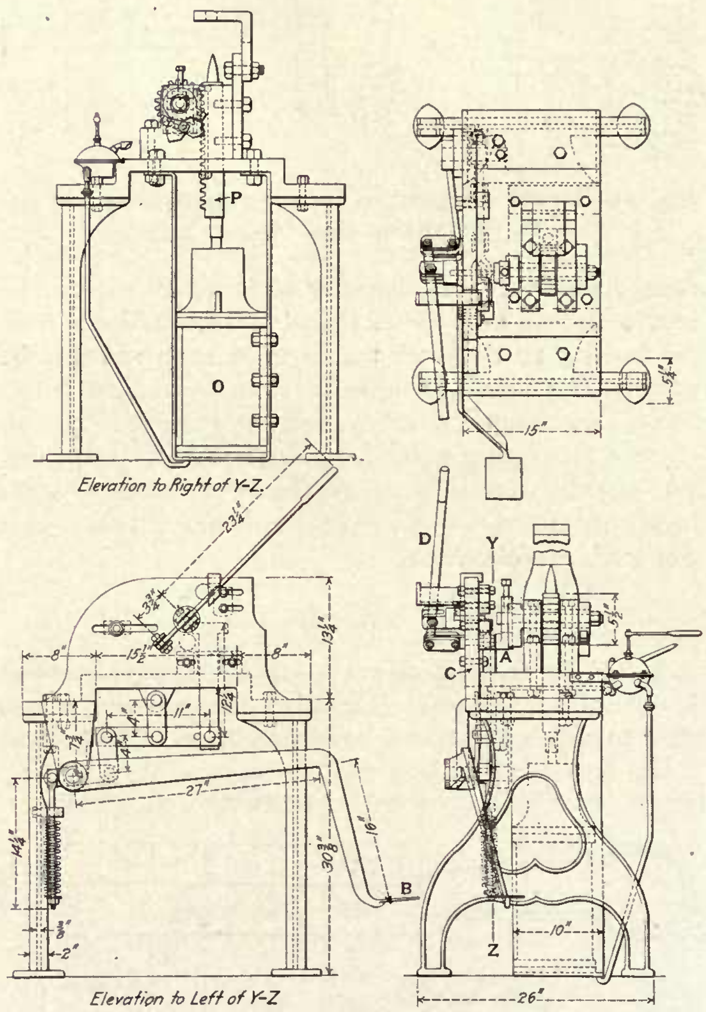



**Fig. 451—Eye-bolt Bending Machine.**

## FIRE RAKE, FORGING.

The dies shown in Figs. 452 and 453 are used to weld the forks of clinker rakes to the handles. They were designed for use on a 2½-in. bolt heading machine, but this work may also be done in a forging machine or a bulldozer. Fig. 452 shows the fork and handle in position for welding. After being welded the fork is bent to shape in the bending machine. By this method the operator may weld and bend the rakes in one heat; 300 rakes have been welded and bent in nine hours. The fork is made of 1-in. round iron taken from scrap material and is cut to length and pointed in a bolt header or under a steam hammer. The handle is made of ⅞-in. round iron and is cut to the required length. The handles are bent in an eye-bending machine, 500 being bent in nine hours. The total labor cost of making the rakes complete is 4½ cents per rake.—*W. H. Fetner, Master Mechanic, and C. L. Dickert, General Foreman, Central of Georgia, Macon, Ga.*

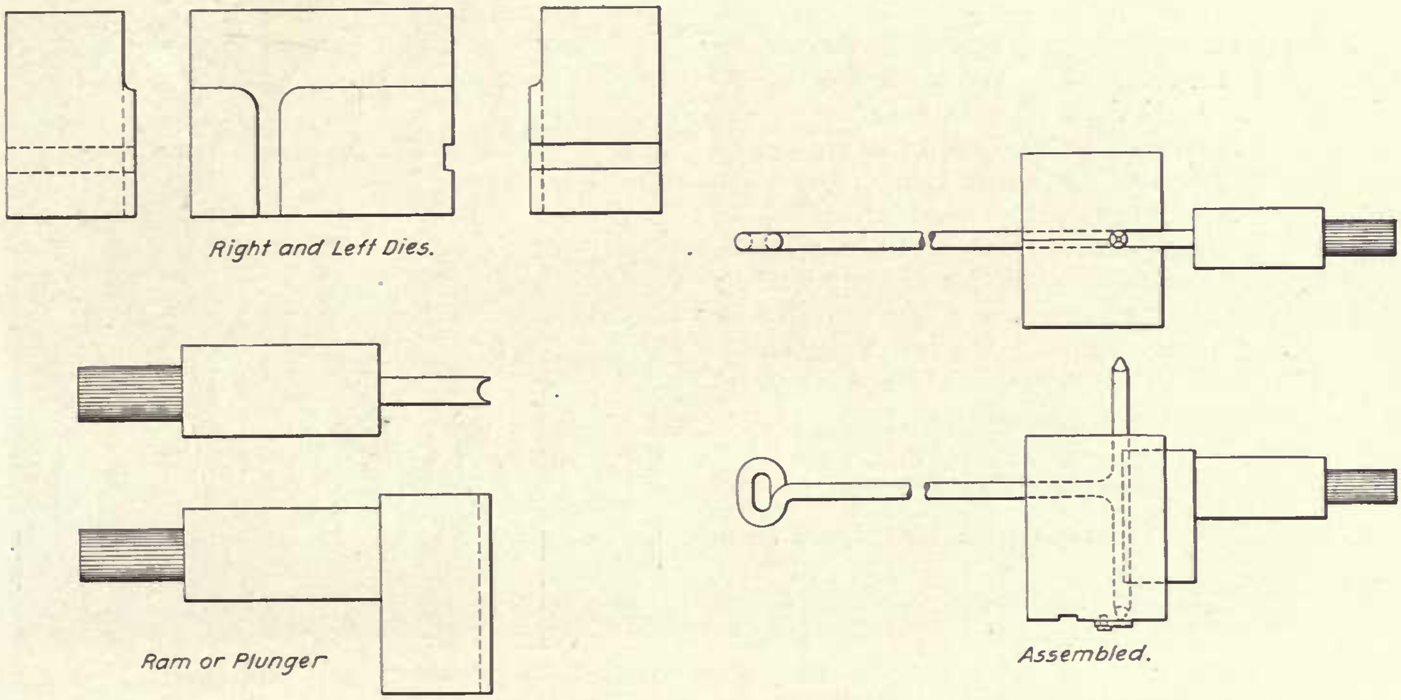



**Fig. 452—Dies for Welding Fork on Clinker Rakes.**

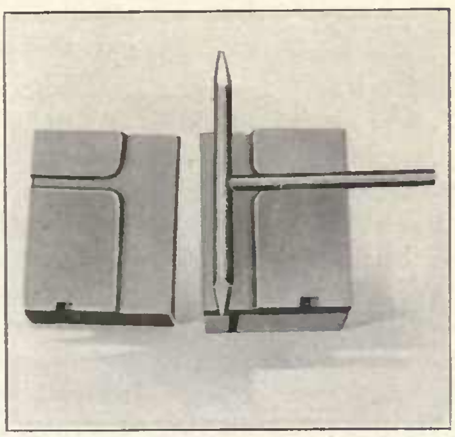


**Fig. 453—Dies for Welding Fork on Clinker Rakes.**

## FIRE RAKE, FORGING.

Dies and tools for making fire rakes in three operations, after the iron is cut to shape, are shown in Fig. 454. The machine for bending the handle is shown at the lower part of the illustration. A roller *A* is fastened to the wheel under the bed plate, which is turned by admitting air to the cylinder *C*, causing the pin roller *A* to travel around in the groove *B*. A rod is placed between *A* and *D* and is bent into proper shape for the handle when the above operation takes place. A stop, not shown on the drawing, is placed just beyond the letter *B* to gage the proper length of stock for the

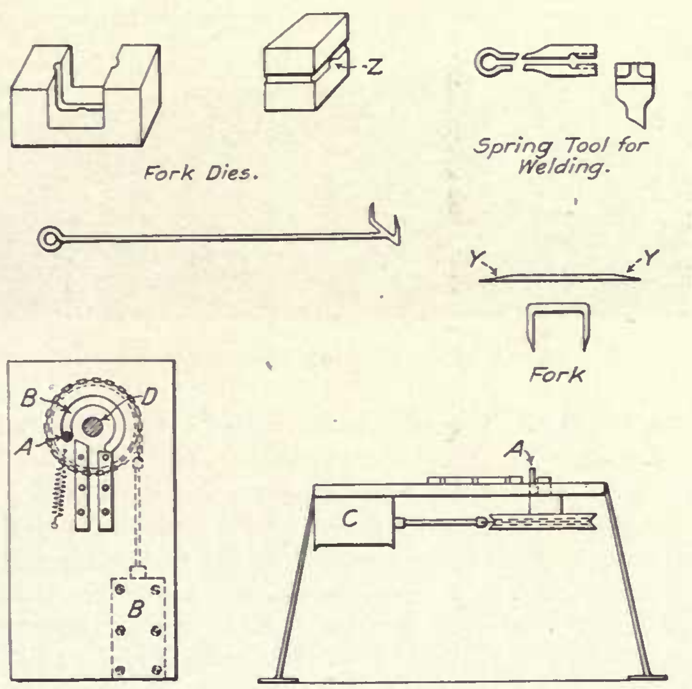



**Fig. 454—Tools for Making Fire Rakes.**

handle. The hot iron must first be bent slightly so that the bar will fit between the two parallel bars that are riveted to the top of the table, while the hot end extends between *A* and *D* and rests against the stop. A spring attached to the wheel under the bed plate quickly brings the roller *A* back to the initial position after the handle is bent.

The hook or fork part of the rake is sheared to the required length with the ends pointed as shown. It is then bent in the dies, the point *Z* on the male die making the proper scarf in the center of the fork to weld the handle to. These dies can be made for a bulldozer or for use under a steam hammer. The handle and fork are welded together with the spring tool shown in the upper right hand corner of the illustration. The weld can also be made in an up-setting machine. The end of the handle is first cut at the necessary angle for properly welding to the fork. These tools are inexpensive and may be made of old material usually to be found about a railway repair shop.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

FIRE RAKE HANDLES, BENDING.

A set of dies for bending clinker bar handles on a forging machine is shown in Fig. 455. The part *A* is bolted to the crosshead, and the base *B* to the bed of the machine. When *A* travels backward the spring *H* pulls the die *C* open as it moves backward away from the roller *G*. At the same time the plunger *D* starts backward, and as it clears the end of the die *E*, the spring *L* pulls *E* to the left. The clinker bar heated to a red heat is thrust in to the left of the center piece *M* until it strikes the stop *F*, which allows just enough material

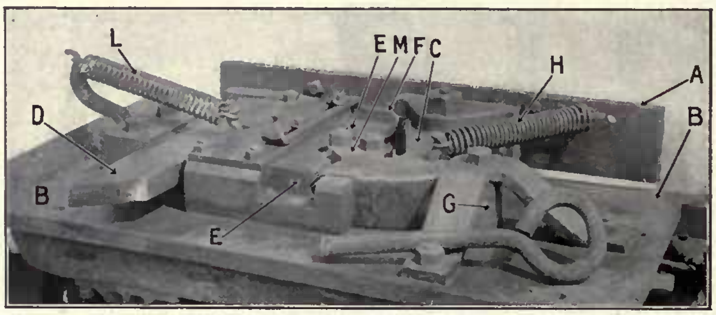



Fig. 455—Dies for Forming Clinker Bar Handles.

for bending. The crosshead then comes forward and the plunger *D* strikes the curved side of the die *E* and forces it toward the center, bending the iron about the left side of *M*. The die *C* then comes in contact with the iron and bends it downward until the die strikes the roller *G*, when it is swept inward and around the center piece *M*. One of the handles is shown in the foreground in the photograph.—*Chicago & Northwestern, Chicago.*

FORGE, PORTABLE.

The portable forge shown in Fig. 456 is designed for the use of a blacksmith when working on small parts in the erecting shop, such as setting running board brackets. Otherwise it is necessary to heat these pieces in the blacksmith shop and carry them hot to the erecting

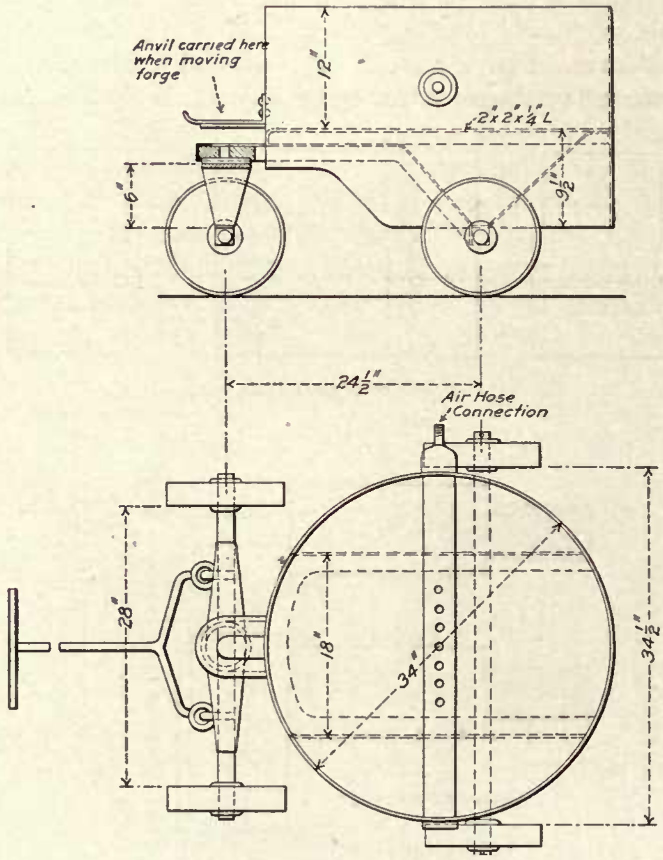



Fig. 456—Portable Forge.

shop. An anvil is carried on the bracket shown, but is placed on the floor when being used. Provision is made for an air hose connection, as shown.—*Elmo N. Owen, General Foreman, Southern Pacific, Bakersfield, Cal.*

FORGINGS, COMPARATIVE COST OF MACHINE AND HAND MADE.

Samples of the standard forgings used on locomotives and cars and made at the Mt. Clare shops are shown in Fig. 457. A collection of the actual forgings in a case which is accessible to every blacksmith in the shop, is certainly far better than a file of blue prints of the pieces, as a mechanic can more easily make a forging from a sample than he can from a blueprint. Each forging is numbered and these numbers correspond to the names of the pieces given on the accompanying list. The list shows a comparison between the cost of making these forgings by hand and the cost when making them by machine. As the actual amount of money involved in each case is not necessary for this comparison, we have expressed the machine forged cost saving in per cent. of the hand-forged cost, the latter being considered 100 per cent. in each case. In those cases of pieces which are still hand-forged or always have been machine forged, no cost savings are, of course, given. Small forgings are listed in lots of 100 pieces.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

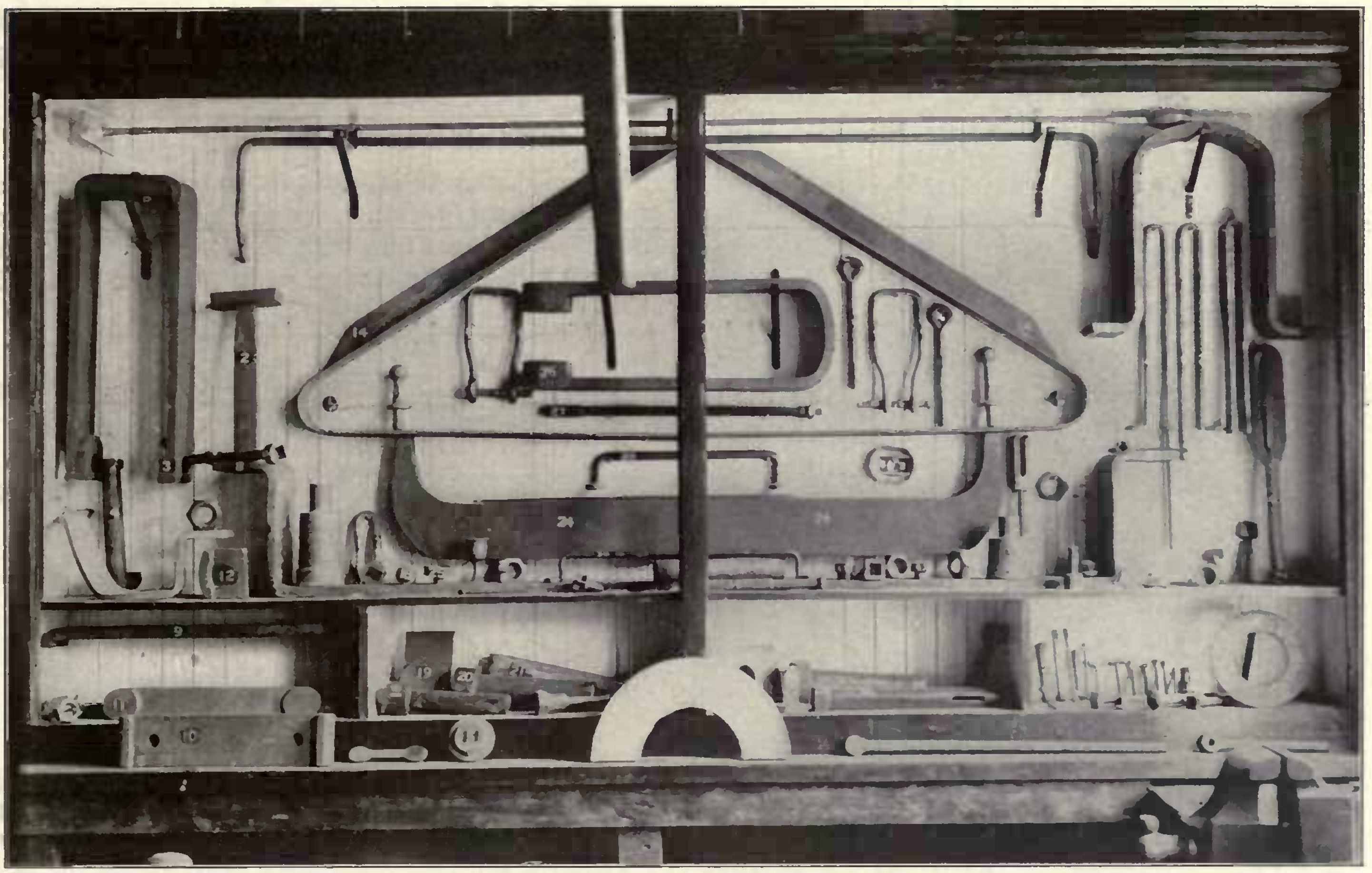


**Fig 457—Machine and Hand Made Forgings.**

LIST SHOWING NUMBERS OF FORGINGS, WITH PER CENT. SAVING WHEN MACHINE-MADE, HAND-FORGED COST BEING 100 PER CENT.

| No. | Name of parts. | Pieces. | Mach.-frgd., per cent. saving. |
|---|---|---|---|
| 1. | Uncoupling lever for engine and tender | 1 | 64.3 |
| 2. | Boiler brace crow foot | 1 | 50.0 |
| 3. | Tender draw-bar yoke | 1 | 80.7 |
| 5. | Collar nut, Class E-24 | 1 | 60.4 |
| 6. | Brake-shaft stands, Class M-8 cars | 1 | 92.7 |
| 7. | Knuckle-pin and cross-head pin nuts | 100 | 93.1 |
| 8. | Top bolster piece, Class 3-A 5-6 | 1 | 76.5 |
| 9. | Miner draft-gear yoke, Class M-11 | 1 | 91.3 |
| 10. | Carrier iron, Miner draft-gear | 1 | 75.0 |
| 11. | Boiler sling brace | 1 | 66.6 |
| 12. | Radial yoke end | ... | ... |
| 14. | Pilot band | 1 | 75.4 |
| 15. | Socket wrench | 1 | 68.3 |
| 16. | Crank-pin bolt | 100 | 99.0 |
| 17. | Truck and body lever connection—B. P. 12458 | 1 | 50.0 |
| 18. | 6-in. and 12-in. jack screws | 100 | 96.1 |
| 19. | Radial drawbar yoke end | ... | ... |
| 20. | 3-in. hexagonal head bolts | 100 | 90.6 |
| 21. | Dead lever guides—B. P. 6911 | 100 | ... |
| 22. | Boiler plug | 1 | 95.3 |
| 23. | Flexible staybolt spuds | 100 | ... |
| 24. | Crown bar, Class E-16 | 1 | 40.0 |
| 25. | Compression grease cup | 1 | 60.0 |
| 26. | Westinghouse draft-gear yoke | 1 | 73.4 |
| 27. | Radial staybolts | 100 | ... |
| 28. | Round lever guide for tender | 1 | 83.3 |
| 29. | ⅞-in. brake-hanger eyes, bent & welded 1 heat | 100 | 53.1 |
| 30. | ⅝-in. grab iron for all freight cars | 100 | 50.0 |
| 31. | Flexible staybolts forged instead of turned | 100 | ... |
| 32. | Knuckle-pin | 1 | 1.7 |
| 33. | Flue-welding job on machine | ... | ... |
| 34. | Tail-pins punched | 100 | 75.0 |
| 35. | 3-in. square head bolts | 100 | 95.5 |
| 36. | Blow-off cock handle | 1 | 94.9 |
| 37. | Follower plate | 100 | ... |
| 38. | Fulcrum jaw for caboose car | 1 | 72.9 |
| 39. | Hand-rail column | 1 | 57.1 |
| 40. | Steel car spring hanger, Class N-8 9 | 1 | 92.0 |
| 41. | Live lever guide with collar | 1 | 84.6 |
| 42. | Live lever guide without collar | 1 | 86.3 |
| 43. | Drawbar loop | ... | ... |
| 44. | ¾-in. brake-beam hanger output, increased from 900 to 2,150 per day, the loop of hanger increased from 450 to 1,000 per day | 100 | 22.2 |
| 45. | Brake-hanger key bolt punched | 100 | 95.2 |
| 46. | Flexible staybolt cap nut | 100 | 93.7 |
| 47. | Flexible staybolt spud | 100 | ... |
| 48. | Radial staybolt cap nut | ... | ... |
| 49. | Westinghouse air pump valve | 1 | ... |
| 50. | Welded eye bolt | 100 | 64.0 |
| 51. | Bent eye bolt | 100 | 62.5 |
| 52. | Boiler safety cap | 1 | 52.4 |
| 53. | Boiler rivets | 100 | ... |
| 54. | Crown-bar bolts | 100 | ... |
| 55. | Center plate liners | 100 | ... |
| 56. | ¾-in., ⅞-in. and 1-in. patch bolts | 100 | 92.0 |
| 57. | Fire rakes | 1 | 58.5 |

## FRAME TRUCK.

A relic of the days before the advent of traveling cranes is shown in the photograph, Fig. 458. Long locomotive frames are difficult to handle without crane service or when being taken to or from the blacksmith shop. The common method is that of using a hand car, but such a car is so wide that it is difficult to get it around the shop and between the pits; besides, it requires some ten or twelve men to handle a large frame in this way. The truck shown is made in two pieces and is held together by the rough bolt seen between the spokes of the wheel. It so happened that the balancing point in this frame fell in the center of one jaw, in which case it was necessary to use a block between the upper ends of the uprights, otherwise the lower frame rail would occupy that position. By balancing a frame on this truck, six men may easily handle the largest ones. This truck will be found especially useful in a small shop not having traveling crane service.—*Lehigh Valley, Sayre, Pa.*

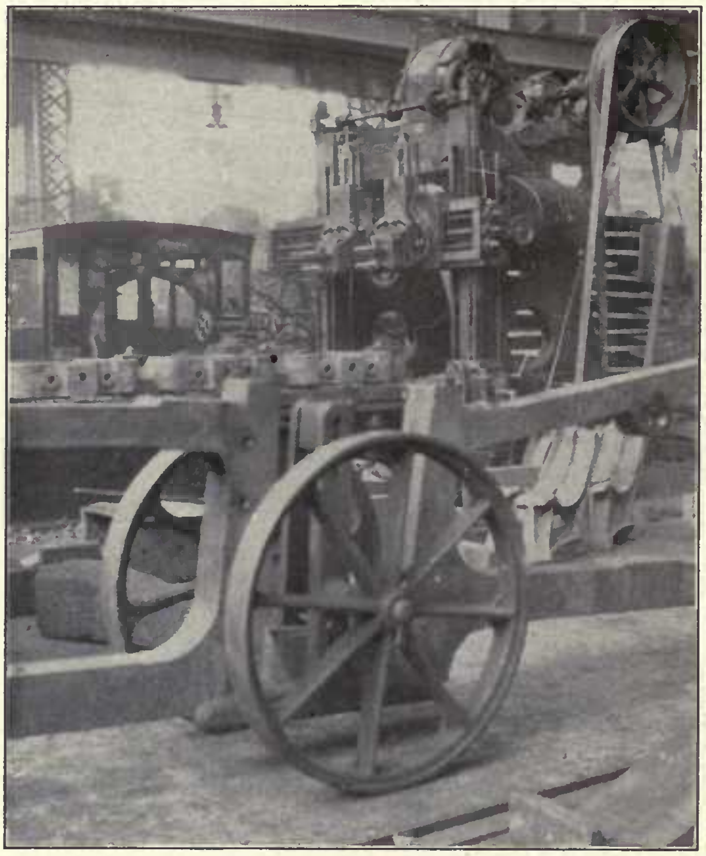


Fig. 458—Truck for Transporting Locomotive Frames.

FRAME WELDING, OIL BURNER FOR.

Two oil tanks, 12 in. x 33 in., set on two-wheeled trucks, are used in welding frames in position. Four to five gals. of oil per tank with 180 lbs. air pressure are required to make the average weld. A frame 5 in. x 5 in. and one 2½ in. x 12 in. have been successfully welded in these shops by this method. The drawing, Fig. 459, shows the general design of the burner used.—*K. J. Lamcool and J. S. Naery, Jr., Special Apprentices, Chicago, Indiana & Louisville, Lafayette, Ind.*

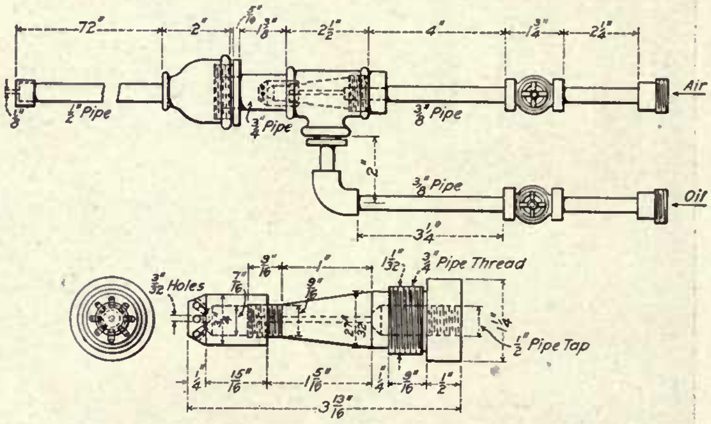



Fig. 459—Oil Burner.

FRAME, WELDING.

The photograph, Fig. 460, illustrates a recent job of frame welding at the Fort Wayne shop of the Wabash.

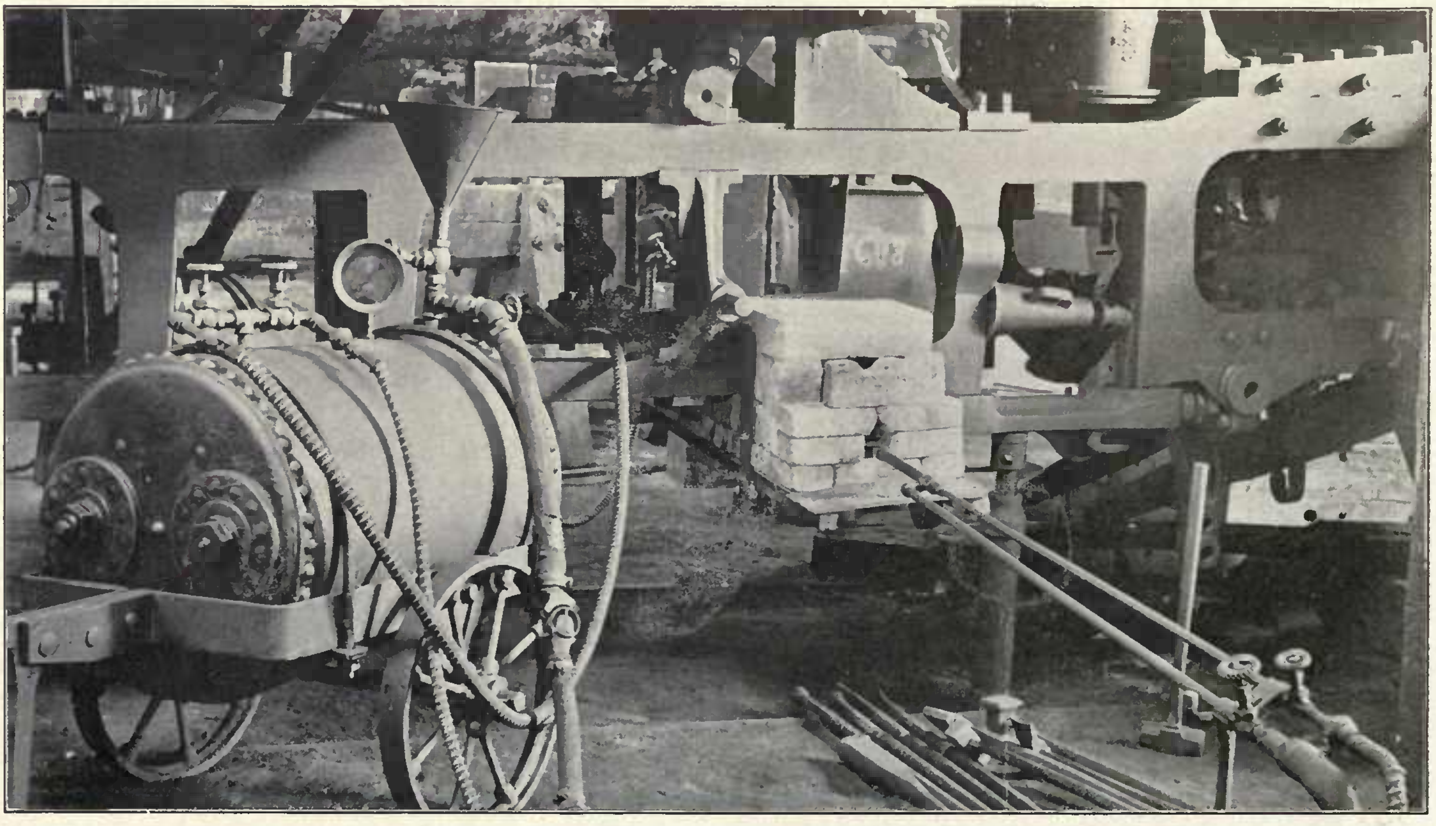


Fig. 460—Welding a Frame with Crude Oil.

This method of welding frames is in use at all the main shops on the Wabash system, in addition to being used in taking care of broken frames at roundhouses. To weld the top or bottom rail of a frame without taking it down is not difficult and is quite frequently done by simply dropping one pair of wheels. In this case, however, practically an entire new leg was welded on, as shown, without taking the frame down. The piece forming the new leg was first forged and finished, then held in place by applying the pedestal binder and a jack between the jaws. A home made crude oil burner, shown in Fig. 461, was used and the weld in the bottom rail was made first in order to take care of the longitudinal expansion. The photograph shows the manner in which the welds were made; the ends of the frame were tapered and the ends of the new jaw were made V shaped, with sufficient metal to form the weld. The total expense was $57.43, including labor for forging and finishing the new pieces, and the cost of the firebrick, clay and crude oil.—*Fort Wayne, Ind., Wabash Railroad.*

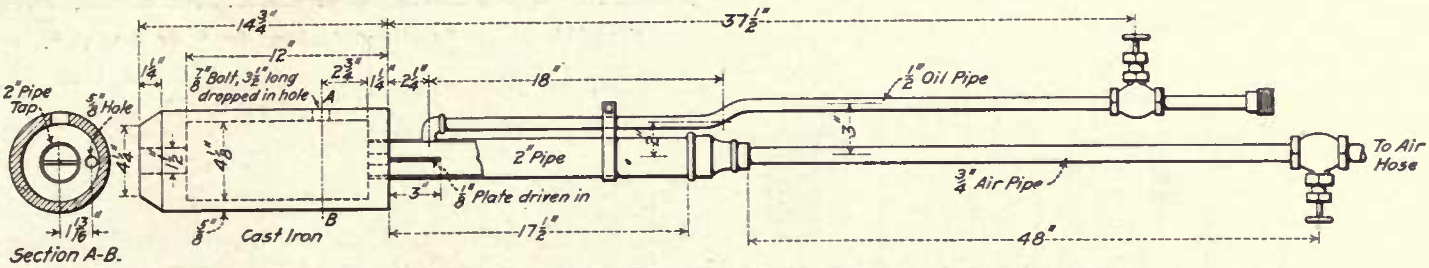



Fig. 461—Crude Oil Burner Used for Welding Locomotive Frames.

FRAME WELDING WITH THERMIT.

The use of Thermit for locomotive frame welding during the past few years has demonstrated the fact that a frame can be permanently welded in place on a locomotive, and that the section thus welded is easily as strong as, and in most cases stronger than, the original section. The illustration, Fig. 462, shows a steel frame section Thermit-welded to the frame in place under the locomotive when it was in the back shop for light repairs on March 7, 1907. This locomotive is at present in service with the same frame in perfect condition. These steel sections are now being applied to all of this class engine when they are shopped; 31 engines have these Thermit-welded sections, 15 of which are thus equipped on both sides. The weld is made in the following manner: After the old section is cut away the steel section is bolted in position, with from ¾-in. to 1-in. open space between the abutting ends to allow for a free flow of the Thermit. The frame is trammed for its final position and then jacked long of the tram marks from 7/32-in to ¼-in., which is later taken up when the Thermit contracts on cooling. Short steel wedges are driven between the adjoining ends of both rails to hold them in position, after which the jacks are removed. A wax collar, from ¾-in. to 1-in. thick, and overlapping from 1½-in. to 2-in. on each side of the opening, is then applied to the top rail. The bottom half of the mold box is then adjusted and a spreading bar, extending between the backs of the adjacent frame legs, is put in place and held by a wedge during the preheating of the section to be welded. This preheating takes from an hour to an hour and a half, according to the size of the frame, which must be brought to a white or fusing heat. A 75-lb. crucible with a ½-in. tapping hole is swung above the frame and directly above the pouring gate of the mold. When the frame is sufficiently heated, the fire is turned off, the jet pipe removed and the ignition powder lighted. After the Thermit has become set, the spreading bar is removed and the lower rail is welded in the same manner as the upper one.

Thermit welding, to be a success, must be properly handled, and it is also important that due allowance be made for shrinkage and releasing of the strains which are set up in the frame. To relieve these strains, the forward leg of the second jaw is heated after the weld has cooled. Thermit frame welding was begun at Elizabethport in January, 1905, and up to the present time about 300 welds of all kinds have been made, with no failures of welds, although failures have occurred in both old frames and new steel sections adjacent to the Thermit welds. Previous to August, 1906, all welds were made without preheating, as the 5,400-deg. Fahr. heat of the reaction was considered sufficient to perfectly amalgamate the metals. Since that time, however, preheating has always been resorted to and the result has been much more satisfactory. There are at present several locomotive frames in service having as many as five and six welds.—*George W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

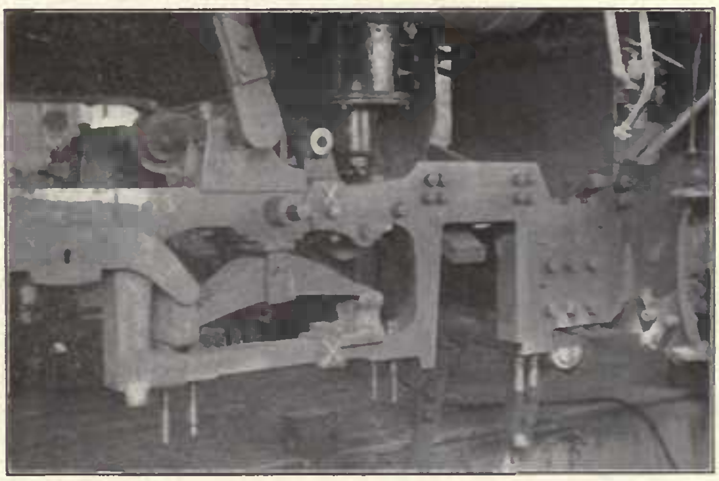


Fig. 462—Steel Section Welded to Frame with Thermit.

### FRAME WELDING, WOOD COLLAR FOR THERMIT.

A method of using white pine wood, instead of wax, for forming the collar around a locomotive frame when making a Thermit weld is shown in Fig. 463. This method is used entirely in the Jacksonville shops of the Seaboard Air Line. The wood is not only much cheaper than the wax which would be required, but the frame is

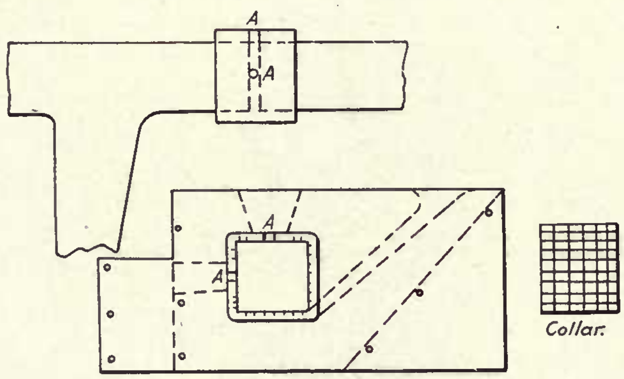



**Fig. 463—Wood Collar for Thermit Weld.**

heated in about two-thirds the time required when wax is used. The interior face of the wood mold is changed to a heated band, which aids in heating the frame. The inside surface of the collar is checked as shown. This reduces its thickness and allows the collar to burn out more quickly. After the mold has been packed and the plugs removed, ¾-in. holes are drilled through the collar at the points marked *A*. This method has given good satisfaction at our shops.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

### HOOK BENDING MACHINE.

The two photos, Figs. 464 and 465, show a machine or tool for bending hooks, especially for train chains. The open position is shown in Fig. 464 and the closed, or forming position, in Fig. 465. The two parts of the die about which the hook is formed and which are hinged together so that the finished hook can easily be removed are beveled at the edges. These bevels, when the hinge is closed, provide a mold which gives the proper section to the hook. The same effect is gotten on the outside of

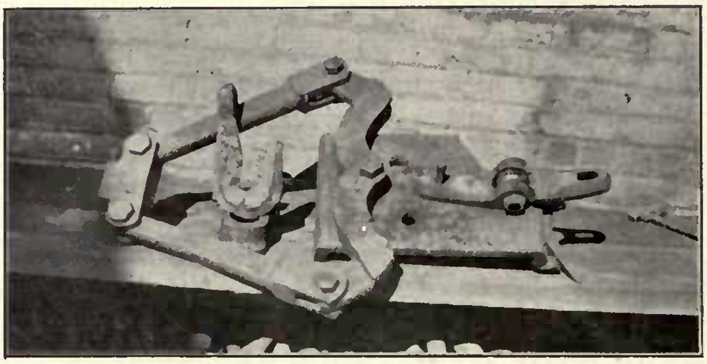


**Fig. 464—Hook Bending Machine in Open Position.**

the hook by the groove in the formers.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

### PATCH BOLT DIES.

The patch bolt dies shown in Fig. 466 are interesting as illustrating a method of making a small forging in one

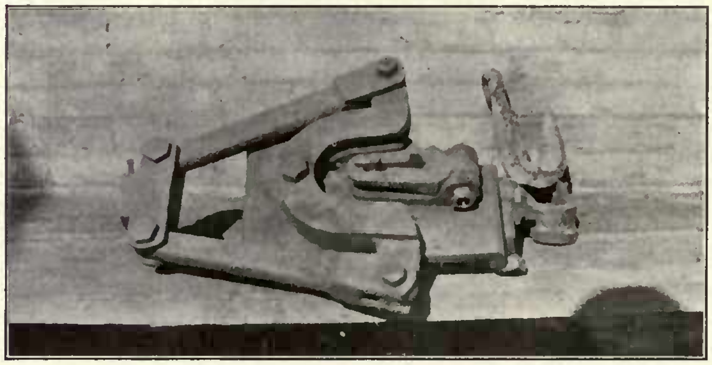


**Fig. 465—Hook Bending Machine at Close of Operation.**

combined movement. The assembled view at the right of the drawing, showing the position of the dies, the knife and the plunger when the bolt is finished, is almost self explanatory. The metal is passed through the die plate and the cast steel knife shears off sufficient metal for the finished bolt and continues the movement which places the stock in line with the cast steel plunger which forms the bolt. The bolt is thrown from the dies by a kicker pin which passes through the ⅜-in. hole in the knife. The knife is made of cast steel and is circular in

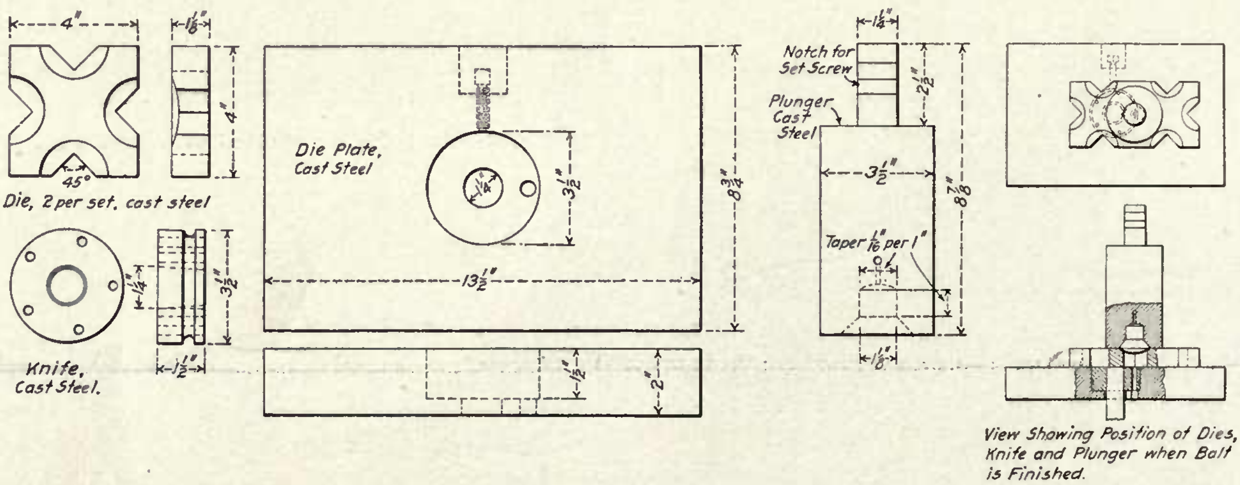



**Fig. 466—Patch Bolt Dies.**

shape, being successively revolved into a new position as the cutting edge becomes worn. The set screw shown in the die plate holds the knife in position. The drawing shows the original design, which has been changed somewhat by bolting high speed steel strips on the top of the dies, providing a counterbore which the plunger enters rather than merely meeting the flat surface as shown in the drawing. These dies are used on a 1½-in. Acme heading and forging machine. It is important that stock of the correct diameter be used with such dies. Use 15-16-in. round iron for making a bolt to be sized for a 1 3-16-in. diameter tap and having a 13-16-in. square end, and use 1 1-16-in. round iron for bolts to be sized

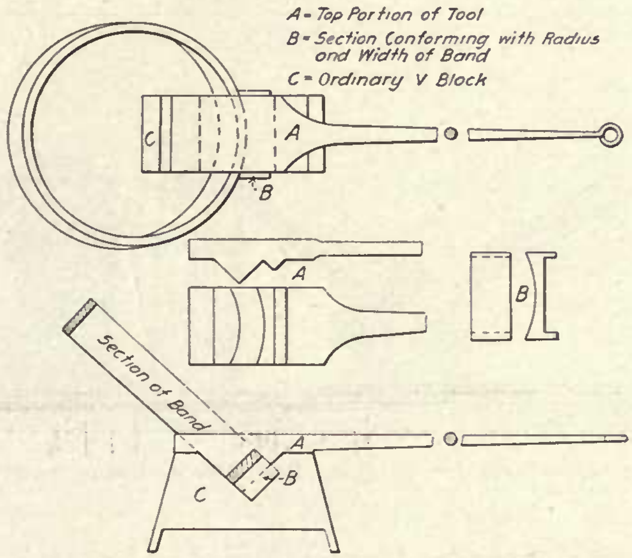



**Fig. 467—Steam Hammer Pile Band Tool.**

for 1 3-16-in. to 1⅜-in. diameter taps and having 15-16-in. square ends.—*George W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

PILE BAND, TOOL FOR WELDING.

A tool for welding pile bands under a steam hammer is shown in Fig. 467. The block *C* rests on the anvil of the hammer and the band takes a diagonal position,

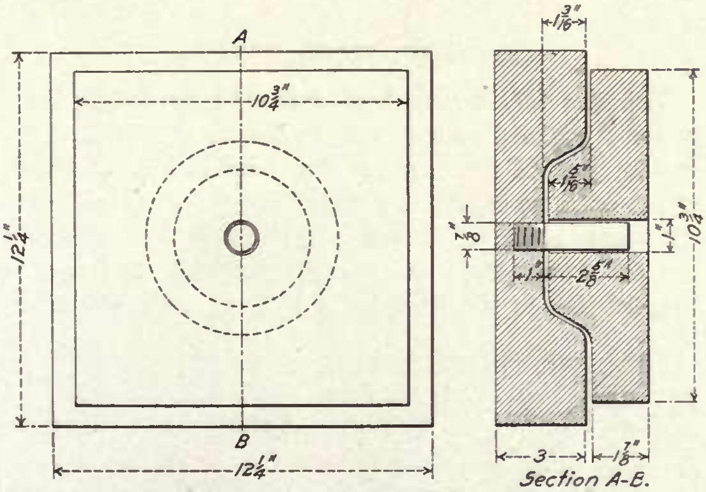



**Fig. 468—Dies for Making Piston Swab Holder.**

so that the necessary hammer blows may be struck. The several parts, *A* and *B*, are described in the notations on the drawing. —*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

PISTON SWAB HOLDER, DIES FOR.

Dies for making piston swab holders are illustrated in Fig. 468; similar ones are used for the swab holder for valve stems. The 1/16-in. sheet steel has a hole punched in its center and is slipped over the ⅞-in. stud in the lower die. The upper die is then placed over it and the swab holder is formed to shape under a steam hammer.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

ROD GREASE CUPS, TOOLS FOR WELDING ON.

The tools shown in Fig. 469 are used successfully in welding finished grease and oil cups on main and side rods. An inside and an outside welding tool are used

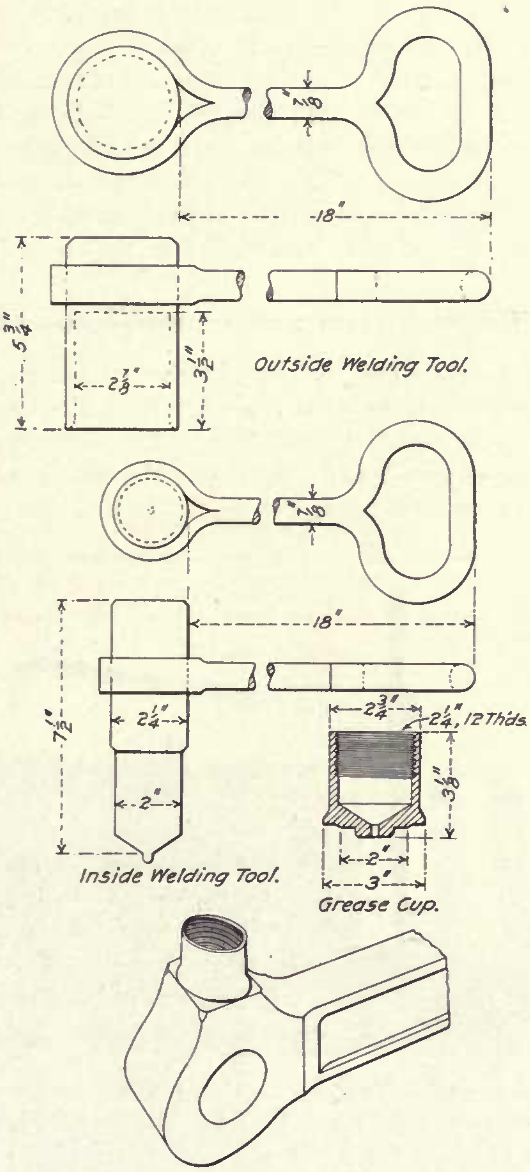



**Fig. 469—Grease Cup and Tools for Welding It to Connecting Rod.**

and a few light taps on each with a small 6 or 8-lb. hammer will make the weld. Sand or some other welding compound should be used to insure a good weld; it is important that the heated end of the rod extend over the side of the anvil during welding to avoid damage to the rod. The grease cup is made of soft steel from bar stock and is finished in a turret lathe. In making the weld, the inside tool should always be used first and the outside one should follow it as quickly as possible. After a few trials any blacksmith can successfully handle these tools and weld oil cups to rods at the rate of five per hour without damaging the threads in the cup or disfiguring the cups or rods. These tools have been in use at the Columbus shops for several years with splendid results. The parts are heated to a welding heat in a common forge using a good grade of coal.—*E. G. Gross, Master Mechanic, Central of Georgia, Columbus, Ga.*

ROD STRAPS, BENDING.

A main rod strap, with the former that is used in bending it under a steam hammer, is shown at the left of the photograph, Fig. 470. A template for the stock is shown back of the former and to the right. The former is placed on the anvil of the hammer and the heated metal is placed across it, with the oil cup boss against the shoulder on the left side of the die. The block shown in front of the die is then placed on the stock and it is finally formed by a succession of hammer blows, it being necessary to use additional blocks as the strap forms.

HOPPER CARRIER IRON FORMER, COAL CAR.

Dies for bending coal bar hopper carrier irons, a finished one of which is shown resting on top of the formers, are shown at the right in the photograph, Fig. 470. The upper former fastens to the crosshead of the bulldozer and the lower one to the bed of the machine.

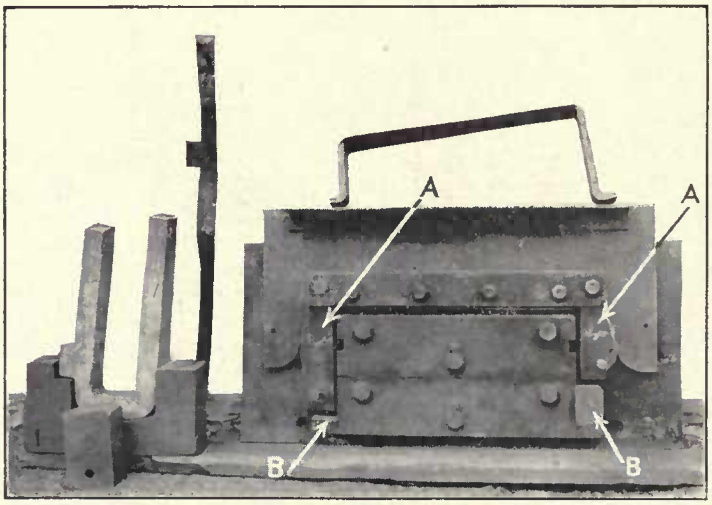



**Fig. 470—Dies for Bending Main Rod Straps under a Steam Hammer and for Forging Coal Car Hopper Carrier Irons.**

When it is at full back stroke, the swinging arms, *A-A*, are drawn back parallel to the crosshead by coil springs. That portion of the carrier iron which is horizontal lengthwise when it is in use, slants downward toward the outside and the part of the former which forms it is therefore made accordingly, as close inspection will show. The two arms, *A-A*, have slotted holes which allow the bending of the lips without breaking the metal; when the machine reaches its full forward stroke, the arms are pushed forward to make square bends on the two lips. These carrier irons are made in rights and lefts, and the arms and small blocks, *B-B*, are exchanged when making a change from right to left. The blocks, *B-B*, are made loose, as they have to be removed after the carrier iron is formed, so that it may be gotten out of the machine, due to the slanted side.—*Lehigh Valley, Sayre, Pa.*

ROD STRAPS, FORGING.

Dies for forging rod straps are shown in Fig. 471. The strap is first blocked out in the ordinary manner and is then reheated and bent in the block shown to the left

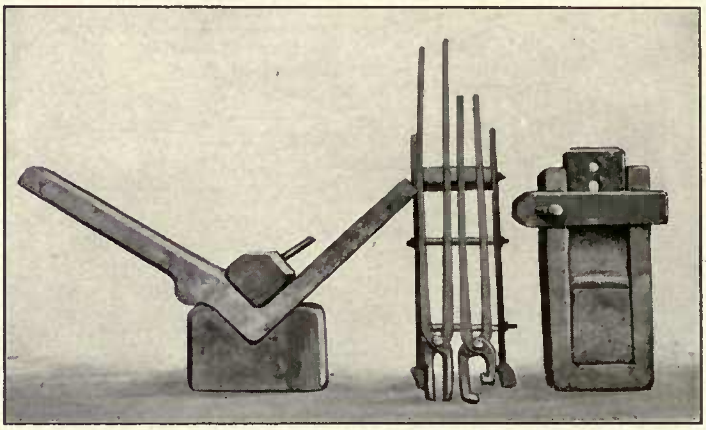


**Fig. 471—Tools for Forging Rod Straps Under a Steam Hammer.**

in the photograph. After both bends have been made, the block for straightening and forming the inside of the strap is inserted; the clamp is then put on and the block is driven down into place. The various tools for handling the strap in the different stages of its construction are shown near the middle of the photograph.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic; Henry Holder, General Foreman, and James Lynch, Blacksmith Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

SMOKEBOX BRACE, FORGING.

The dies for forging both ends of a smokebox brace under a steam hammer are shown in Fig. 472. The bottom foot of the brace is first blocked out, as shown at the extreme right; it is then reheated and finished to the proper shape by the dies shown at the left. The pad for the smoke arch at the other end of the brace is blocked out in the form of a ball, as shown near the

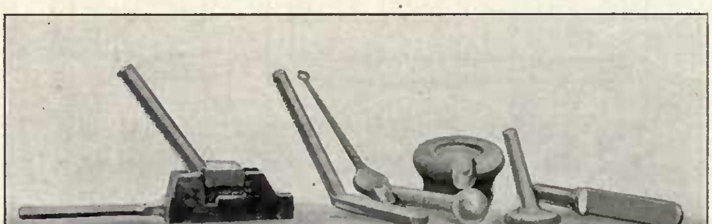


**Fig. 472—Formers for Forging Smokebox Braces Under a Steam Hammer.**

center of the photograph, and is then reheated and formed to the proper shape under the steam hammer in the larger round die. The disk tool with the handle is then used to offset the pad and complete it.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic; Henry Holder, General Foreman, and James Lynch, Blacksmith Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

### SPLIT KEYS, TOOL FOR MAKING.

A stamp and die for making split keys under a steam hammer are shown in Fig. 473. The die has a hole cut through it corresponding to the shape of the key and has welded to it a long handle for manipulating it. The

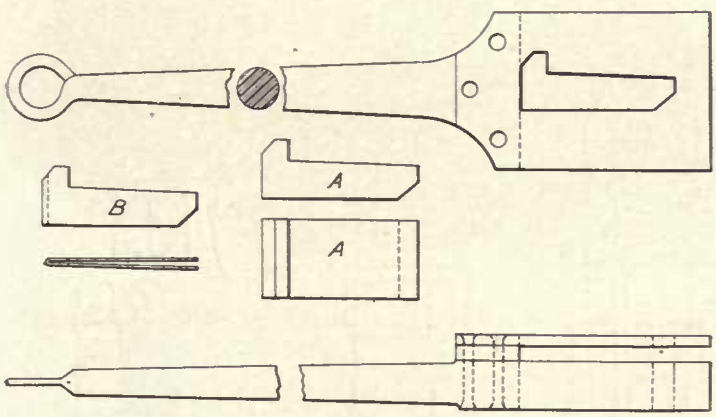



Fig. 473—Device for Making Split Keys Under a Steam Hammer.

punch, *A*, is made to fit into the die, and by laying the iron to be cut over the hole and driving down the punch, the key *B* may be made.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

### SPRING CLIP DIES.

A device for facilitating the work of making spring clips is shown in Fig. 474. The lower block or die is held on the hammer anvil by the 1/8-in. boiler plate sheets which are fastened to the die by 1/2-in. through bolts. The top die is held by a handle tapped into it near its center. Spring clips of the shape shown are made of 3/8-in x 4-in. spring steel. The stock is cut to the proper

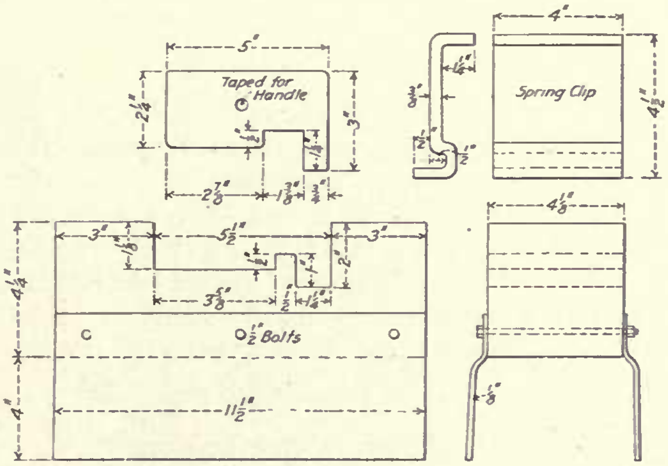



Fig. 474—Dies for Forging Spring Clips Under Steam Hammer.

length, heated and then placed across the lower die. The upper die is forced down by one or two blows of the steam hammer. This device was designed by T. F. McDonald, blacksmith foreman at Stroudsburg.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

### SPRING HANGER GIB DIES.

The pair of dies at the extreme left in the photograph, Fig. 475, is used for making locomotive spring hanger gibs, one of which is shown. The stock is drawn out from scrap tires into strips 7/8-in. x 2 3/8-in. The heated metal is fed into the dies from the top and when the plunger enters, it forces the metal against the knife edges

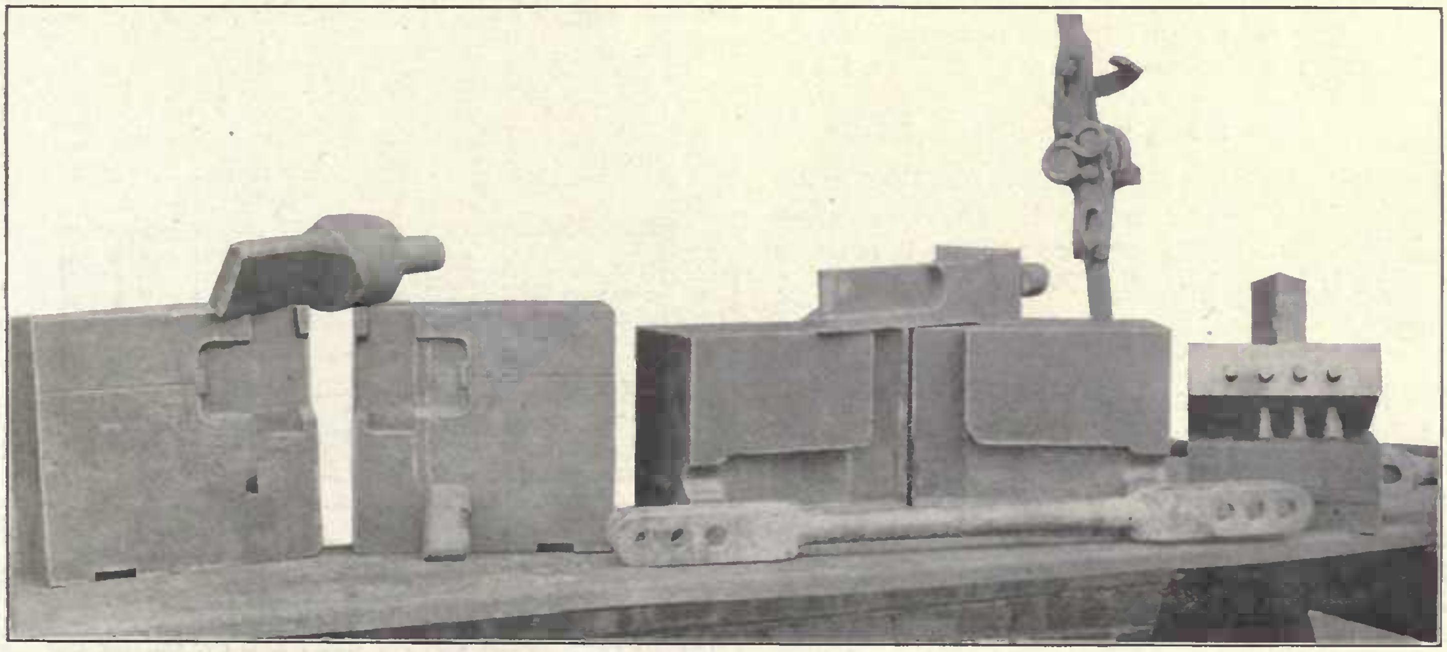


Fig. 475—Dies for Forming Spring Hanger Gibs, Welding Bottom Brake Rods, and Punching Them, and a Device for Bending S-Hooks.

of the steel inlays, cutting off and carrying a portion on into the forms. This then becomes a closed die, and it is necessary to make provision for the air which would be confined. The small grooves machined from the center of the impressions answer this purpose. The gibs are afterward put in a rattler, thus removing the burrs.—*Lehigh Valley, Sayre, Pa.*

### BRAKE RODS, WELDING BOTTOM.

The dies in the center of the photograph, Fig. 475, are used in welding the jaw ends of bottom brake rods. The completed rod is shown in front of the dies. The plunger has a central rib, which enters between the two forks of the jaw, so that pressure is exerted over the entire welding surface. The drawings used in making these dies were furnished by John Roach, master blacksmith of the Philadelphia & Reading.—*Lehigh Valley, Sayre, Pa.*

### BRAKE ROD ENDS, PUNCHING DIES FOR.

The dies at the extreme right in the photograph, Fig. 475, are used on a power punch for punching the three pin holes in the jaws of brake rods, as shown. The upper die with the three punches, is carried by the movable head, while the lower die is fastened to the bed of the machine. This punching work is done after the welding, the end of the rod being inserted in the die as shown at the edge of the photograph. A wedge is then driven in alongside of the stock to force it against the guiding side of the die and thus insure the centering of the holes. This wedge is loosened after the holes are punched, thus relieving the metal and allowing it to be easily removed. The jaw is then turned over for punching the other side. It is necessary in this case to run a strip of thin metal in on the under side of the central portion of the die to prevent the second punchings from dropping partly into the punched holes of the lower half of the jaw, thus preventing its removal. The dies were designed for punching four holes at a time, but this particular job requires only three holes.—*Lehigh Valley, Sayre, Pa.*

### HOOKS, BENDING.

A device for bending S-hooks rapidly by hand is also shown in Fig. 475. The stock used is ½-in. in diameter and is heated in a small furnace near the anvil, to which the device is fastened.—*Lehigh Valley, Sayre, Pa.*

### STAYBOLT, PUNCHING TELL-TALE HOLES.

The Erie uses solid staybolt iron, but instead of drilling tell-tale holes they are hot punched before the bolt is threaded. This is done in a bulldozer, using the die and punch shown, Fig. 476. Provision is made for 15/16-in., 1⅛-in. and 1 3/16-in. iron. The dies are made according to the bulldozer which will receive them. The 3/16-in. steel pin is inserted in the steel plug, which in turn is screwed into the holder. The hole through the plug is drilled of the same diameter as the pin and the plug is then sawed into halves. This provides for clamping the pin firmly when the plug is screwed in place. The small head on the pin is peened cold, the end being pre-

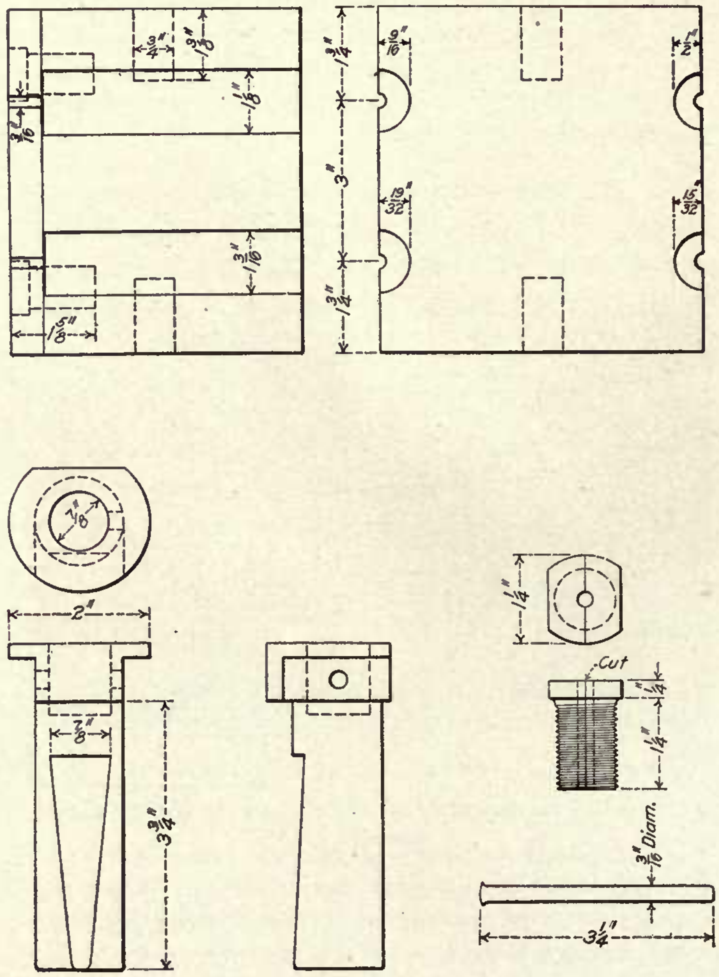



**Fig. 476—Tell-Tale Hole Punching Dies.**

viously annealed. The iron, after being cut into proper lengths, is heated in a furnace. One blow of the steel pin is sufficient to pierce the required tell-tale hole, and the bolts are threaded after cooling.—*Erie Railroad, Meadville, Pa.*

### SPRING SHOP OIL TANK.

A handy oil tank for the spring shop is shown in Fig. 477. It is made of ¼-in. steel and is so constructed that

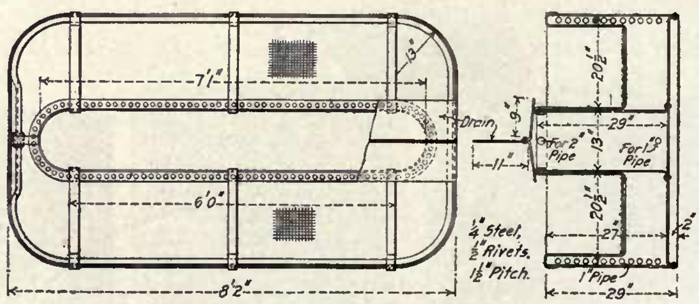



**Fig. 477—Oil Tank in Spring Shop.**

a man can work both sides at one time. It has two compartments, the middle one for water and the outside one for the oil bath. A constant flow of water is maintained in the water compartment in order to keep the oil as cool as possible, the water entering through a 1-in. pipe coil and going out at one end through the 2-in. overflow pipe. A netting is suspended in the oil on each side to hold the plates while submerged.—*Rock Island Lines, Silvis, Ill.*

### STEAM HAMMER, FORGINGS.

The 3,500-lb. steam hammer in the blacksmith shop is made to do a wide variety of work that it was not designed to perform, by the foreman, T. F. Buckley. This is along the line of making die forgings of intricate

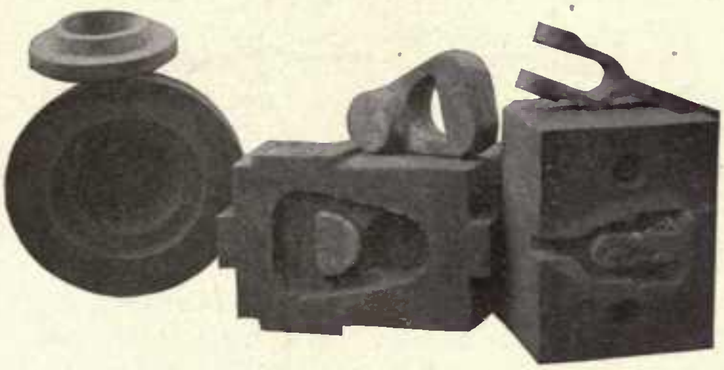


**Fig. 478—Samples of Steam Hammer Forgings and Dies.**

shapes and designs, such as are usually made by the drop press. Three of these dies are shown in Fig. 478 with the forgings made from them resting on top of the respective dies. 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

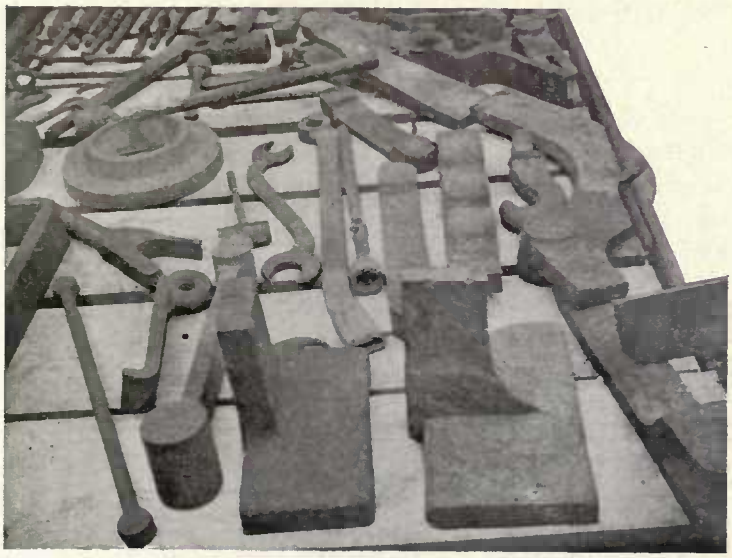


**Fig. 479—Die Forgings Made Under Steam Hammer.**

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 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

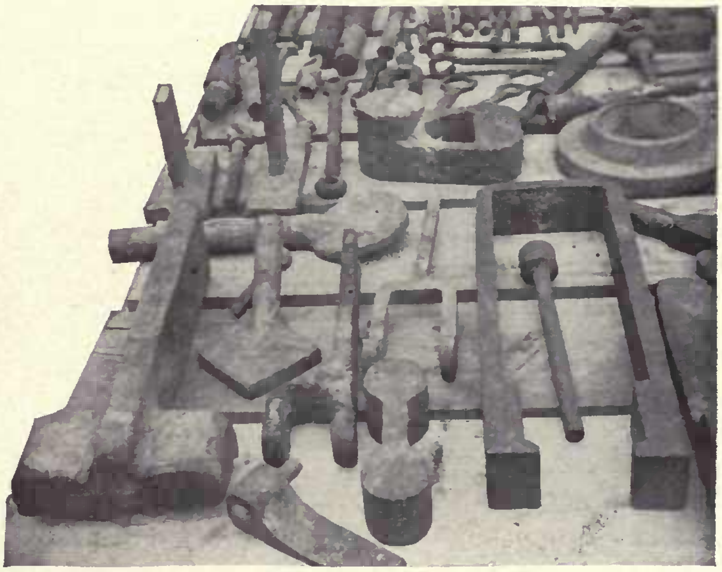


**Fig. 480—Die Forgings Made Under Steam Hammer.**

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, Figs. 479 and 480 and 481, show better, perhaps, than any description what that range and variety is. Here

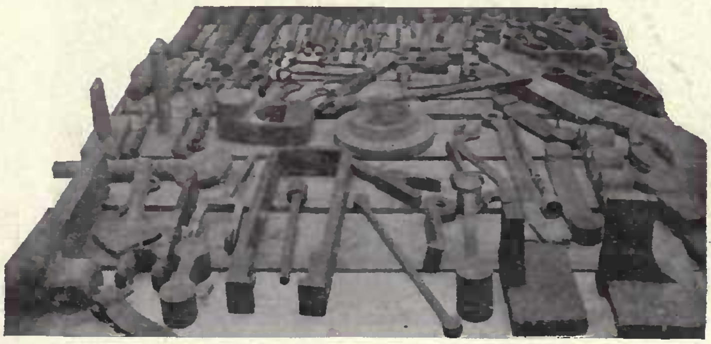


**Fig. 481—Die Forgings Made Under Steam Hammer.**

will be found a variety of pins headed in many ways, jaws for transmission rods, coupler yokes, guide yoke brackets, fire hoes and hooks. 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 the saving is still further increased. 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 combined: 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 duplicate work.—*Delaware, Lackawanna & Western, Scranton, Pa.*

STEAM HAMMER TOOL RACK.

One of our tool racks and the method of keeping formers used under steam hammers, so that they can be found easily when needed, is shown in Fig. 482, the piece of work hanging on the same hook with the former with which it is made. This enables the smith, particularly a new man, to find the former without any waste of time. The steam hammer swages, not shown in the photo, but on another rack, are kept in like manner, arranged in rotation from the smallest to the largest sizes; each swage has the size marked on it. This arrangement also saves considerable time. On another rack we keep

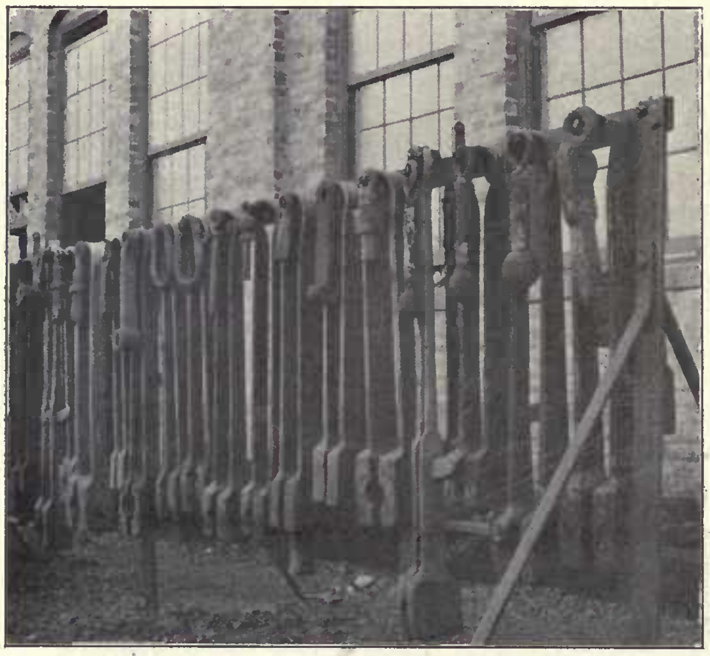


Fig. 482—Rack for the Storage of Steam Hammer Formers.

various tools for steam hammer use, each tool being placed so that it can be found the minute it is wanted. Of course, if the task of keeping these tools in order is left to any and every one, they will not remain in order long; in our case an old helper is assigned to the task of keeping the shop clean and these tools in order. About once a month he oils the working parts of the tools, using a piece of cotton waste and some cheap black oil. This is particularly necessary in a heavy, damp climate, where such tools rust quickly.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

TOOL RACK AND BENCH.

A convenient tool rack used in the blacksmith shop is shown in Fig. 483. The top of it, on which tools may be laid, revolves on four ball bearing casters. The tools may also be hung on the hooks or between the dowel pins

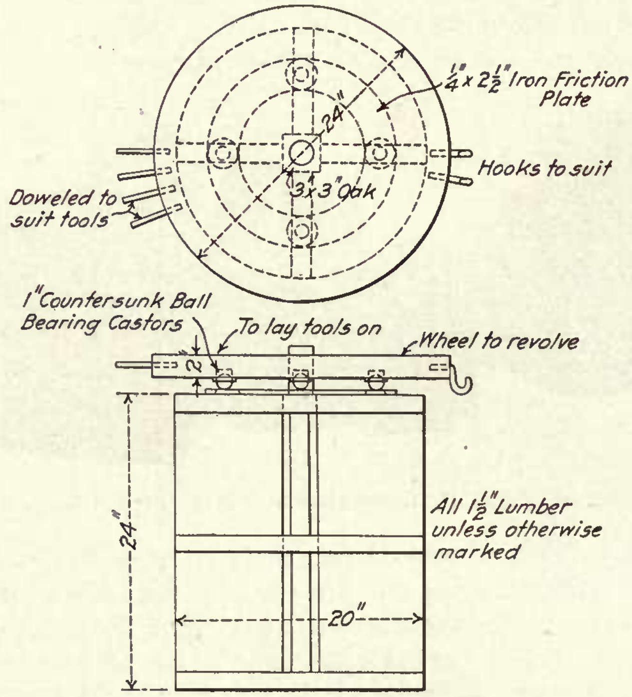



Fig. 483—Blacksmith's Tool Rack or Bench.

on the circumference of the revolving table. The compartments underneath may be used for the storage of tools or material.—*William H. Wolfgang, Draftsman, Wheeling & Lake Erie, Toledo, Ohio.*

WRENCHES, FORGING.

A set of dies and holders for punching and forming flat wrenches in a bulldozer is shown in Fig. 484. The first operation in making these wrenches is to cut the blank, and the dies for this operation are shown at the left of the drawing. The second operation is the bending

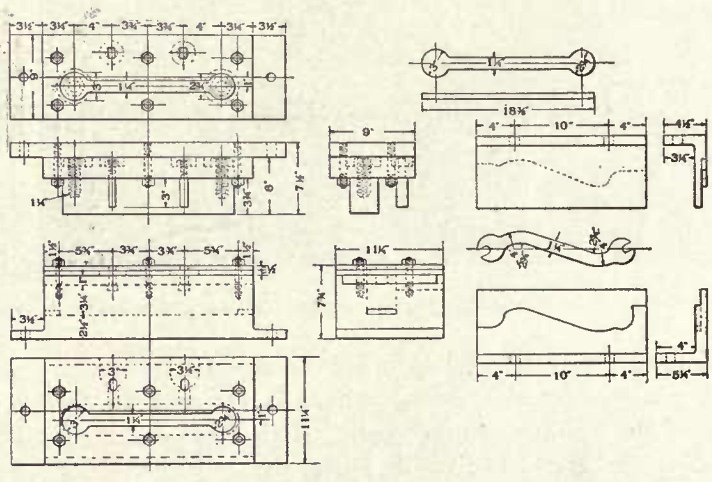


Fig. 484—Wrench Punching and Forming Dies.

of the blank to the desired shape, and the forming dies for this process are shown at the right of the sketch. The third and final operation is the cutting out of the opening for the jaws. All three operations are done with one heating. This device will make wrenches for ⅜-in. to 1-in. nuts at a rate of 250 an hour with two men.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

WEDGE BOLT KEEPERS, FORGING.

The tool for forging wedge bolt keepers, shown in Fig. 485, may be used on a bulldozer or air press. It consists of a head, *A*, and a crosshead, to which the connections *D* are pinned. These in turn are attached by pins to the forming pieces, *C*, the other ends of which are connected to the piece *B*. When the head is drawn back the forming pieces are in the position shown by the dotted lines. The piece to be shaped is straight and is placed between *B* and the anvil. Pressure is then applied, and the first move is to clamp the piece solidly. Then, as the head moves on, the forming pieces, *C*, are turned about the pins in the crosshead and come down against the work. When the stroke is completed the piece has been bent to the shape shown on the drawing. The same device can be used for coupler carrier irons.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

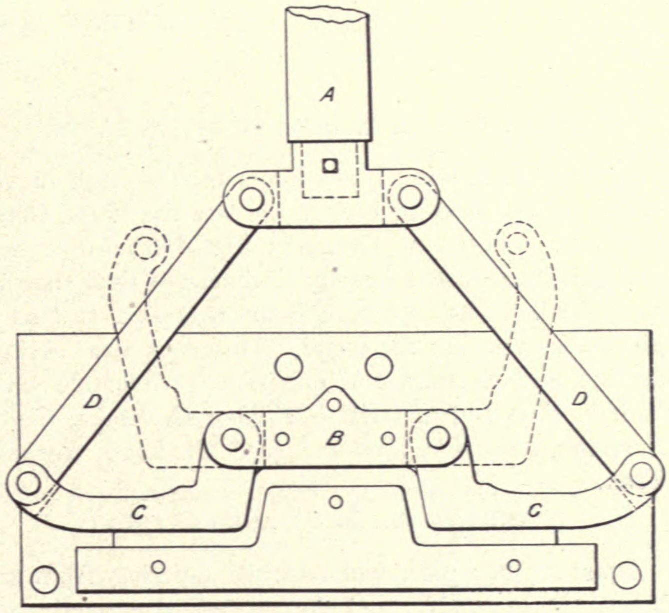



Fig. 485—Tool for Making Wedge Bolt Keepers, or Coupler Carrier Irons.

# Brass Foundry Kinks

CROSSHEAD GIB, CASTING BRASS LINERS ON.

Instead of riveting brass liners on cast iron or steel crossheads or driving boxes, we cast the brass directly on them. The clamp shown in Fig. 486 may be easily and quickly adjusted for any thickness of liner that may be desired. It has not been found necessary to heat the gib before pouring the metal. This does away with all drilling and riveting, and effects a considerable saving both in time and material.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

DRIVING BOX BRASS ANCHOR PINS.

Brass anchor pins, when turned tapering from stick brass, are expensive, and the process also requires the time of a mechanic and a machine which can be used to better advantage for other purposes. If it is possible to mold these anchor pins in a metal chill and have them sufficiently true for use without machining, a considerable saving can be made. The chill shown in the accompanying sketch, Fig. 487, was designed with this end in view. The chill is made of cast iron, having six holes tapered down from 1 7/16 in. to 1⅛ in. in diameter. A polished metal face plate is used with the chill, the larger end of the tapered holes being closed by the face plate. The metal is poured into the small ends. This precaution is taken so that if there is any piping in the metal during cooling, this piping, with the dirt which it may contain, will not be on the end which comes in con-

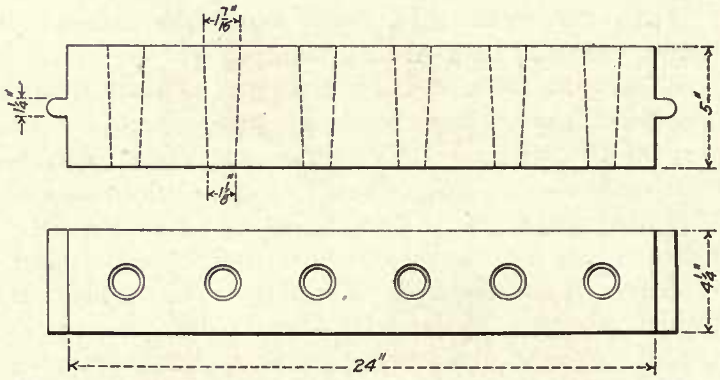



**Fig. 487—Chill for Molding Anchor Pins for Driving Box Brasses**

tact with the journal.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

DRIVING BOX BRASS, CASTING ON BOX.

A. O. Berry, superintendent of the Elkhart, Ind., shops of the Lake Shore & Michigan Southern, gave a description at the meeting of the International Railway General Foremen's Association of the method used at that shop for pouring the brass bearing of driving boxes on the steel boxes, thus saving the necessity of slotting

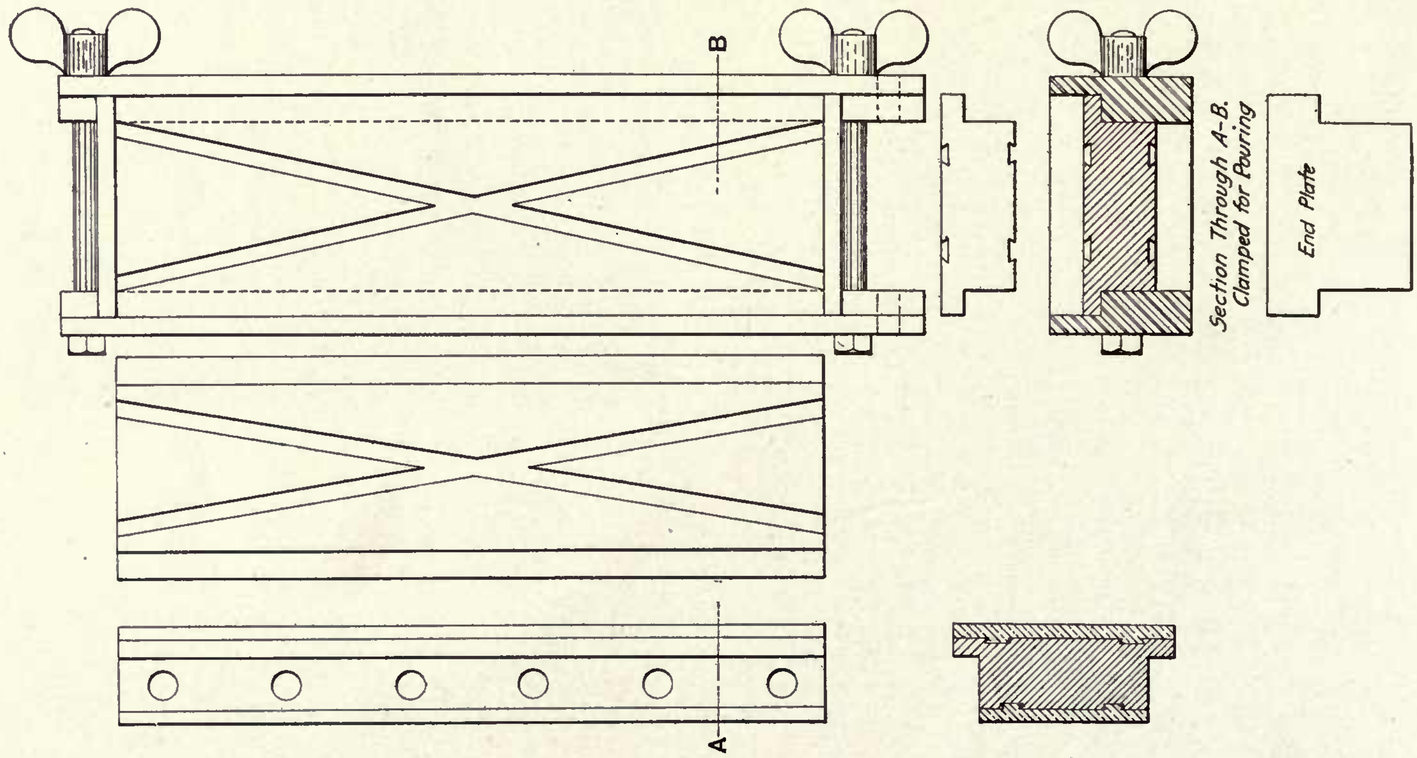



**Fig. 486—Clamp Used for Casting Brass Liner on Crosshead Gib.**

the boxes and turning the bearings. This method is as follows: After the old shell is pressed out, the box is sent to the slotter, where five dove-tailed grooves are cut in the old shell bearing, as shown on *Fig. 1* (Fig. 488.) If the box is too thin on top, the upper groove may be done away with, and only four grooves applied, bringing the two middle ones a little closer to the top. Likewise, if it is found that the two extreme lower grooves will cut through into the shoe or wedge face, they can be brought upward or not be made as deep as the other grooves. These grooves are 1¼ in. to 2 in. in length, and ¼-in. to ⅜-in. deep.

The box is then taken to the boring mill and a groove is cut in the hub face about ½-in. deep and ½-in. wide at

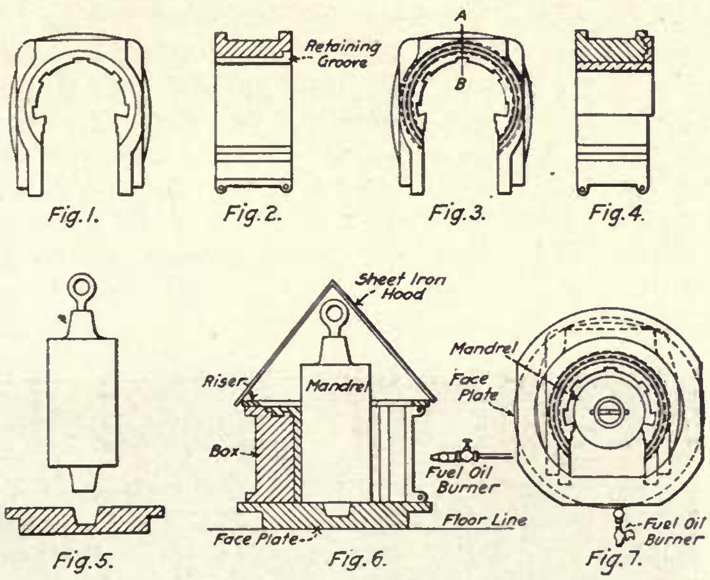



**Fig. 488—Casting Bearings in Driving Box.**

the edge of the old crown bearing as shown in *Fig. 2*. This groove is shown also in *Fig. 1*, and may be called a "retaining groove," inasmuch as it will retain the shell in the box, even if it becomes slightly loose. If the design of the box calls for a hub-liner and the hub-face on the box is not already grooved for retaining some soft metal, then the box is left on the boring mill until dove-tailed grooves are cut in the hub-face for retaining the brass liner.

*Fig. 4* shows a cross-section through *A-B* of *Fig. 3*, with the brass poured and the hub-liner and crown brass in one solid piece. After the machine operations are completed on the box, it is taken to the brass foundry, where the operations are as follows: The box is set on a face plate with the inside face down and the hub face up, and a cast iron riser is placed over the top of the box, care being taken that all places where the brass is liable to run out are stopped with fire-clay, and a sheet iron hood is placed over the box for retaining the heat thrown out by the oil-burner. A fuel oil torch is then applied between the lower ends of the box; that is, in the cellar space, and the box is heated in this manner until it is dark red. The burner is then taken away, the hood removed and the proper size mandrel dropped in place. The exact position of the box on the face plate is originally determined with the mandrel in place, the mandrel being then removed during the process of heating. After the box is sufficiently heated, and the mandrel is dropped in place, the space between it and the box is lined up with long sheet iron strips dropped in place. Oil holes or other holes in the top of the box are stopped up by means of fire-clay.

*Fig. 6* shows the box after it is heated, and with riser and mandrel in place. It also shows the hood in place. The hood, however, must be removed during the process of pouring, and is simply shown in this sketch to give an idea of its appearance. *Fig. 7* is a plan view of the box, with mandrel and riser in place ready to be poured. The mandrels used are always of a smaller diameter than the driving journal, and all boxes are bored after leaving the brass foundry.—*A. O. Berry, Lake Shore & Michigan Southern, Elkhart, Ind.*

DRIVING BOX, CASTING BRASS LINERS ON.

We cast the brass on the shoe and wedge fits of both steel and cast iron driving boxes and also on the hubs. The boxes are not heated before the brass is poured. The arrangement for preparing the driving boxes for pouring the brass is shown in Fig. 489. The block *D* is placed in the box and the ring *E*, which forms the hub liner and which is 1 in. wide, ⅜ in. thick and of a diameter, to suit the box, is placed in position, the block *D* projecting ½ in. above it, as shown in the illustration.

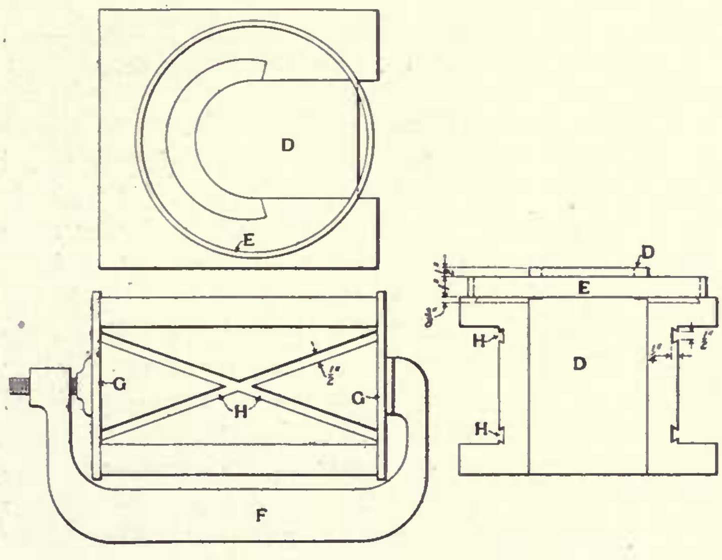



**Fig 489—Driving Box Ready for Pouring Brass.**

The box is dove-tailed to hold the brass securely, the grooves *H H*, crossing in the center and extending to within ¼ in. of the flange. Strips *G* are then clamped at the ends and the joints are luted with clay or asbestos. Attention is directed to our method of reclaming old driving boxes. Before we started applying the brass liners on the shoe and wedge fit we would scrap the box when it had been planed down to a certain limit. Now we plane the box to the limit and then pour a brass liner on it and use it again. This refers to cast iron boxes. The practice of casting liners on the steel driving boxes, instead of riveting, saves about $1.50 in labor on each box. *—William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

#### DRIVING BOX HUB LINER LUBRICATING HOLES.

It is generally accepted as necessary that the hub bearings of driving boxes should be lubricated. Holes are drilled in the box casting from the oil cavity to the bearing, but to maintain these holes after a new bearing has been cast on, although it seems a simple proposition, is really a difficult task, for with the hole covered with the liner and plugged up with the brass the machinist has no means of locating exactly where it should be, and when he attempts to drill it the chances are that he will hit the hole in the casting a little off the center, which usually breaks the drill. This operation of drilling through the liner and redrilling the holes in the box requires, on the average, about one hour. A device shown in Fig. 490 has been provided to do away with this diffi-

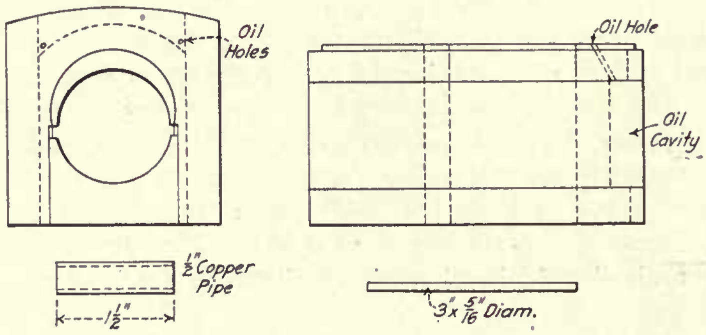



**Fig. 490—Device for Preserving Lubricating Holes When Pouring New Hub Liners on Driving Boxes.**

culty. After the old brass has been stripped off and the box is ready for its new bearing, a small piece of round iron about 5/16 in. in diameter and 3 in. long is placed in the holes previously drilled in the box, and over these pieces are placed ⅜-in. copper pipes, about 1½ in. long, resting squarely against the face of the box. The brass liner may then be poured on and when it has cooled the round iron may be withdrawn, leaving the lubricating holes clear. Care must be taken when pouring the brass to make sure that the copper pipe is of sufficient length so that the brass will not pour over the top, thereby preventing the removing of the round iron. This device costs about one cent per box and saves about 25 cents per box when the cost of broken drills is considered.*—John V. Le Compte, Assistant Foreman, Baltimore & Ohio, Garrett, Ind.*

#### DRIVING BOX REPAIRS.

The parallel rails that are used in babbitting the hub faces of driving boxes at the Mt. Clare shops, page 173, are also used for pouring brass on the shoe and wedge wearing faces. The leveled rails provide for setting the boxes in position, and it is only necessary to provide the barriers at the ends of the box to retain the molten brass. The brass, and babbitt also, is heated in a vertical, cylindrical, brick lined furnace, using oil. After the brass has cooled the boxes are taken to a planer for correcting the box size and then to a drill press, where the oil ways are cut. Three circular oil ways are cut on each face, the tool used being so set that these circular ways intersect at one point each. By this arrangement the oil may pass from the top to the bottom of the box face, but by circular paths. The oil, therefore, does not run down the box face as rapidly as it would with vertical, or even with slanting oil ways, and the circular ways prevent the formation of shoulders on the wearing faces of the shoe or wedge.*—Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

#### FURNACE FOR MELTING BRASS.

An oil-burning crucible furnace for melting brass, for casting driving wheel hub liners, faces on driving and truck boxes, bushings for lift shaft bearings and rocker boxes, etc., is shown in Figs. 491 and 492. The furnace proper is 40 in. in diameter, 36 in. high, and is set 18 in. below the ground level and in a concrete foundation. It is fire-brick lined and has a 9-in. x 9½-in. base in the center, on which the crucible rests. The center line of the blast and oil piping is at about mid-height of the base holding the crucible. The plan view on the drawing shows that the flame is directed into a space between the

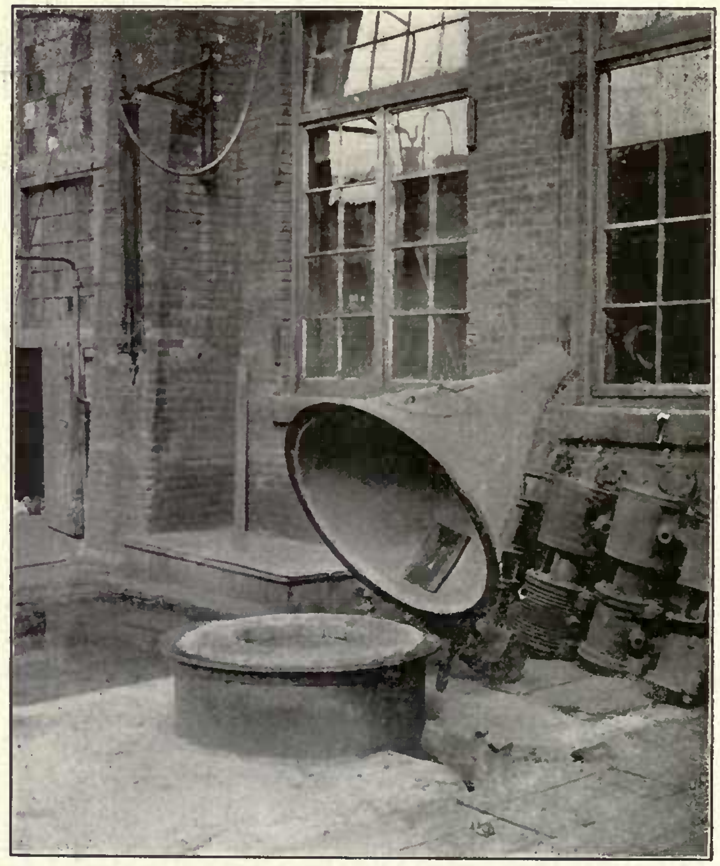


**Fig. 491—Oil Crucible Furnace for Melting Brass.**

base and the brick lining, so that it takes a circular course around the crucible. The furnace was designed along the general lines of a furnace seen during a visit to another shop, with one particular alteration, that of directing the circular flame as shown in the drawing, rather than directing it squarely against the base of the cylindrical pillar.

A detail of the burner, which was designed by E. H. Sweeley, general foreman, is shown in Fig. 493. The air blast, piped from the blacksmith shop, enters through the 1¾-in. pipe and also through the 3-in. gas pipe. The smaller pipe is held concentric with the 3-in. wrought

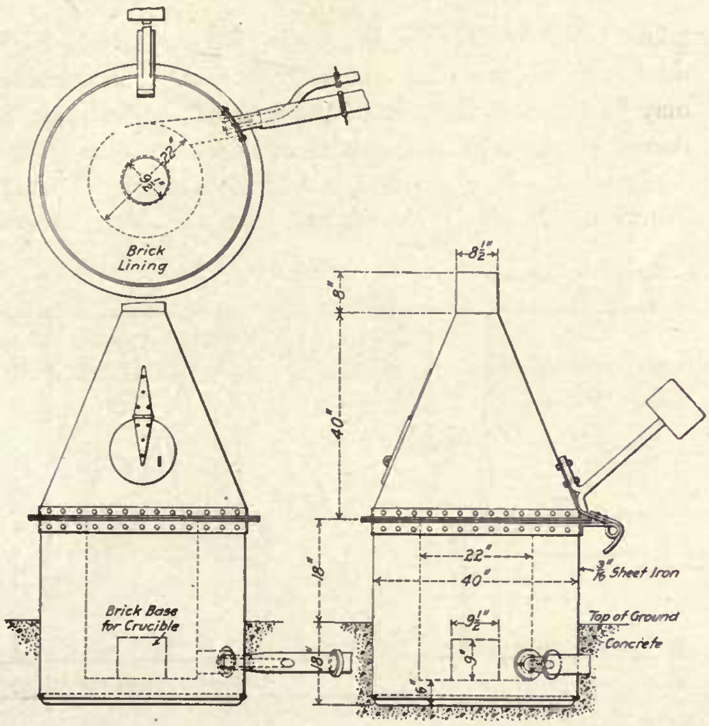



Fig. 492—Details of Oil Crucible Furnace.

iron pipe by three ⅜-in. set screws. Each of these pipes has an individual gate by which the air is regulated and a proper adjustment of these gives the required air supply. The oil supply is piped to the ⅜-in. copper pipe, and jetted through the ⅛-in. hole in its end against the ⅝-in. ball near the mouth of the 1¾-in. pipe, forming a spray. This acts to atomize the crude oil so that it mixes with the air blast.

When this furnace was first installed, it was found that the brass, after being cast for a hub liner, for instance, would crack, showing that the metal was being oxidized in the furnace. It was, naturally, the custom to regulate the oil and air supply to give a smokeless fire, but ex-

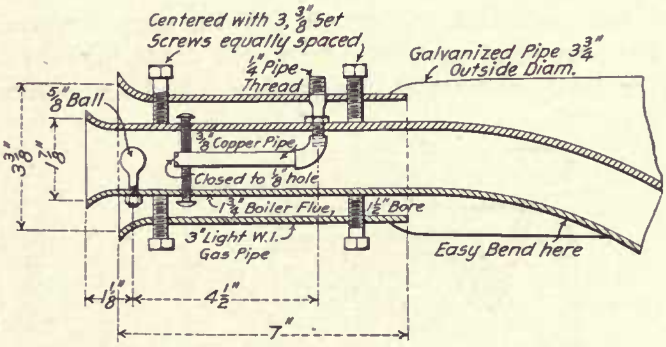



Fig. 493—Section Through Oil Burner.

periments with a slightly smoking fire gave a much better metal and one which would not crack when cold. The crucible will hold just enough metal to pour two hub liners at one heat. It requires 1½ hours to heat a charge in a cold crucible and 50 minutes in a hot crucible. When sufficiently heated, the top of the furnace is thrown back, as shown in the photograph; the crucible is lifted out with tongs and placed in a double handle loop, by which it is carried into the shop where the pouring is to be done.—*Long Island Railroad, Morris Park, N. Y.*

# Tin and Copper Shop Kinks

BABBITT FURNACE.

The furnace shown in Fig. 494 is used for melting babbitt from the faces of driving boxes and other locomotive parts that are brought into the shop for repairs. The parts may be hoisted by a wall crane into the cast iron ladle, under which is an 8-in. Good Luck burner. Gas is supplied to the burner through a 3/8-in. pipe and air through a 1/2-in. pipe. The furnace is a sheet iron box lined with fire brick and having a door on one side. This device does away with the machining or chipping off of the old babbitt from the box, and the melted babbitt thus obtained may be used again.—*R. G. Bennett, Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

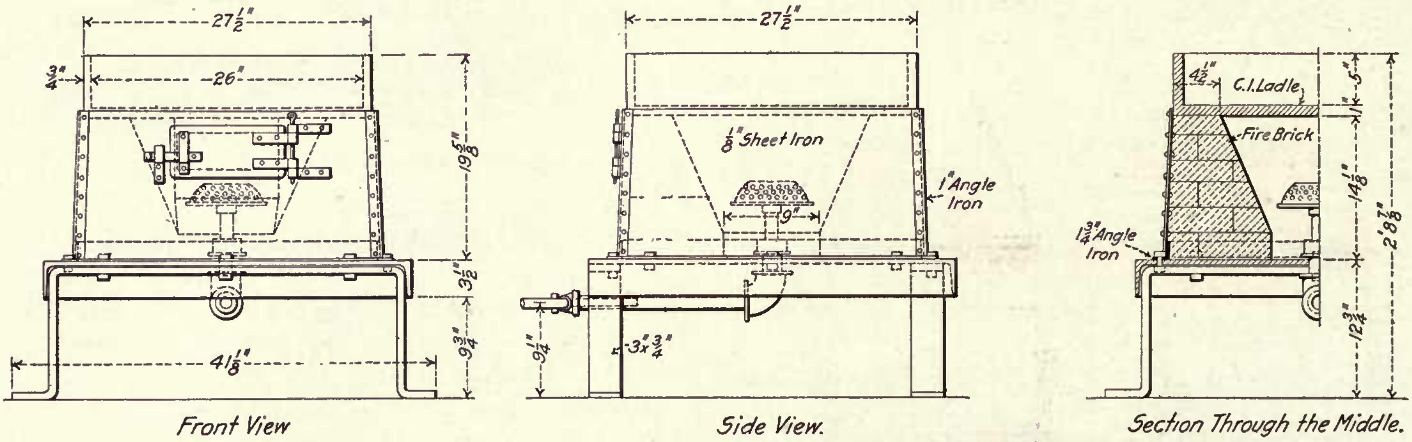



Fig. 494—Babbitt Furnace.

BABBITT FURNACE.

A double furnace for melting two kinds of babbitt is shown in Fig. 495. The bases and the fire pots were taken from two old engine house stoves. Crude oil is used and each stove has a separate burner. The crucibles may be lifted in and out of the tops of the furnaces by means of the lugs. An extra crucible is shown in the foreground.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic, and Henry Holder, General Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

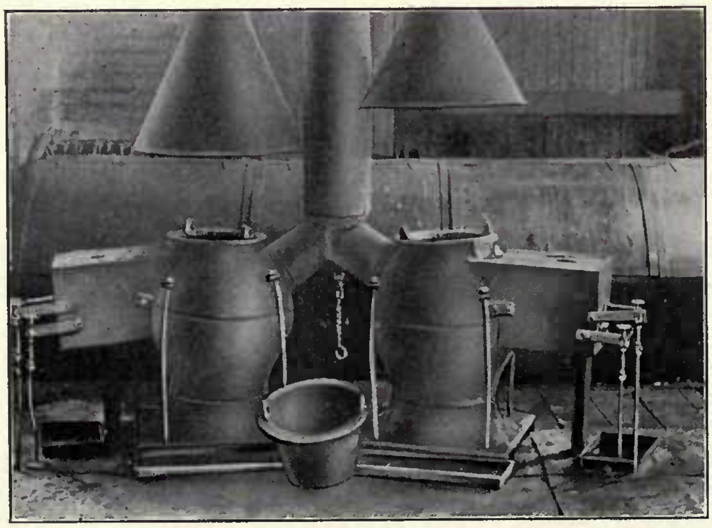


Fig. 495—Double Furnace for Melting Babbit.

CROSSHEAD, BABBITTING.

A device for babbitting crosshead shoes, after which planing is not necessary, is shown in Fig. 496. A material reduction is also made in the cost of babbitting the shoes, and the operation is performed in one-fourth the time required by the old method. Two tapered castings are arranged with grooves on their inside faces to receive a central wedge, the three parts constituting the core. By adjusting the wedge the width of the core is increased or decreased to correspond to the size of the shoe and the thickness of babbitt desired. An adjusting screw is provided for this purpose. The end plates are hinged and close up the ends to retain the babbitt, and are clamped in position by the rods. Strips are also clamped to the core above the crosshead shoe, closing the mold and forming the upper babbitt edge along the flange of the shoe. All parts are arranged to be handled easily and adjusted quickly. As soon as the molten babbitt hardens the device is removed and the crosshead shoe is ready to be applied. The time required for finishing one shoe of a large crosshead with this device is 10 minutes. Under the old methods 42 minutes were required to babbitt and plane up one shoe. As about 4 lbs. of babbitt were removed in the planer, the total saving accomplished by using the device is $1.13, of which $0.88 is material and $0.25 labor. On 1936 crossheads babbitted last year

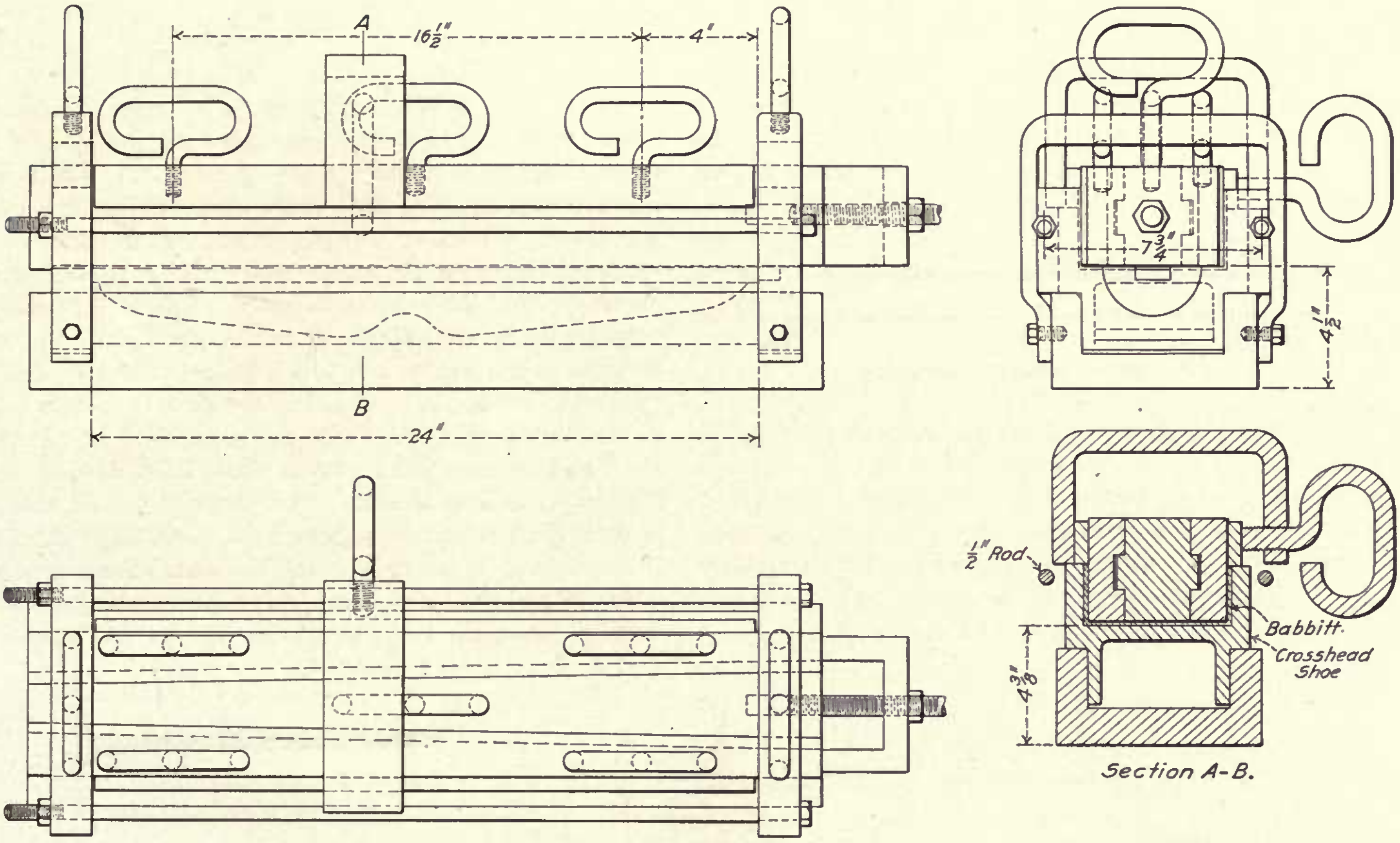



Fig. 496—Crosshead Shoe Babbitting Device.

on the Atchison, Topeka & Santa Fé, a total saving of $2,191.55 was made by the use of this device.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

CROSSHEAD, BABBITTING.

In accordance with what is now common practice, the crossheads are babbitted to a finished fit and without requiring any machine work. For this purpose there is a cast base (Fig. 498) in the center of which a plug is set that is made to enter the piston-rod fit. This holds the flanges vertical. After the crosshead has been heated the U-clamps *A*, Fig. 497, 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 the 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 either side and fills in at the center. This is done because if an attempt were made to pour in at the center 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 pouring into this narrow opening that not a spoonful is spilled. Of course, the metal is tinned before the babbitt is poured in order to secure a proper adherence to the crosshead gib.—*Delaware, Lackawanna & Western, Scranton, Pa.*

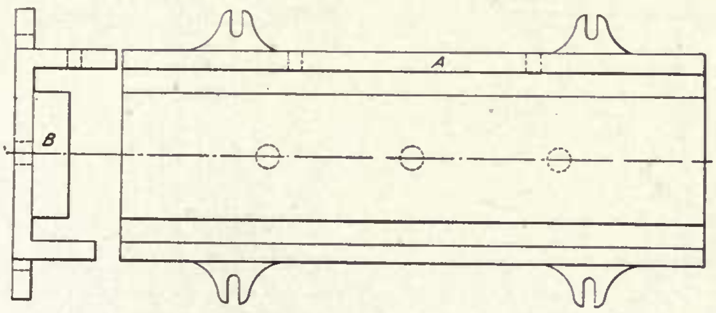



Fig. 497—Clamp Used in Babbitting Crossheads.

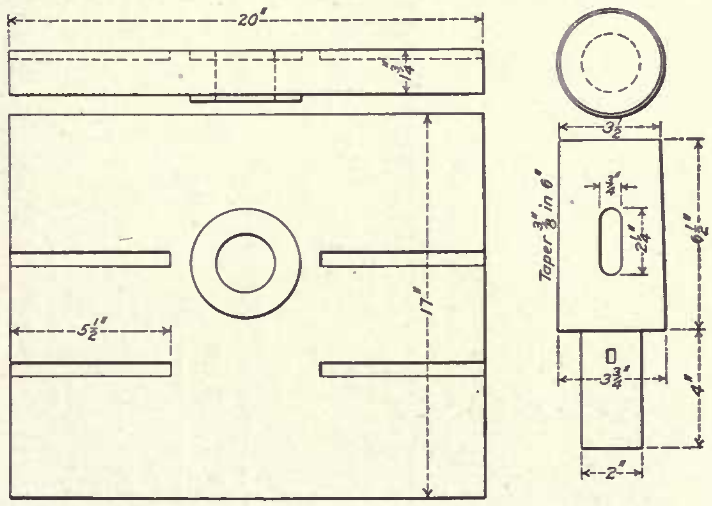



Fig. 498—Device for Babbitting Crossheads.

### CROSSHEAD, BABBITTING.

A device for babbitting two-bar cross-head gibs, so that they are ready for use without any finishing in the planer is shown in Fig. 499. It is made from a piece of 2-in. by 8-in. x 24-in. iron, planed to fit the inside of the gibs. Four set screws are placed in it, one at each corner, for adjusting the thickness of the babbitt. The gib is laid on, as shown, and raised by means of the set screws so that the proper thickness of babbitt will be provided. The babbitt is then poured into the open space, and when it is cold the gib is ready for application without requiring any machine work.—*A. S. Davis, Shop Foreman, Northern Pacific, Jamestown, N. D.*

**Fig. 499—Crosshead Babbitter.**

### CROSSHEAD BABBITTING MACHINE.

A crosshead babbitting machine is used in the shops of the Norfolk & Western by means of which the crosshead is babbitted ready for the engine, and no planing is required after the metal has been poured. It consists of a heavy base *A* (Fig. 500) in the center of which a stiff mandrel *B* is placed. The upper end of the mandrel is turned to mate in the piston fit of the crosshead, and serves to hold the crosshead firmly in place. On either side there are uprights *C*, *C*, which are planed to correspond to the guides and which slide to and fro on the base and may be clamped in any position. On each side of these are stops *D*, *D*, which are brought up against the crosshead to prevent the molten metal from flowing out. These are clamped in place by the cams *E*, *E*, and similar cams at the bottom. The operation is exceedingly simple; the crosshead is put in place on the mandrel, the guides adjusted and the stops clamped in place after which the metal is poured. The device was designed at the Roanoke

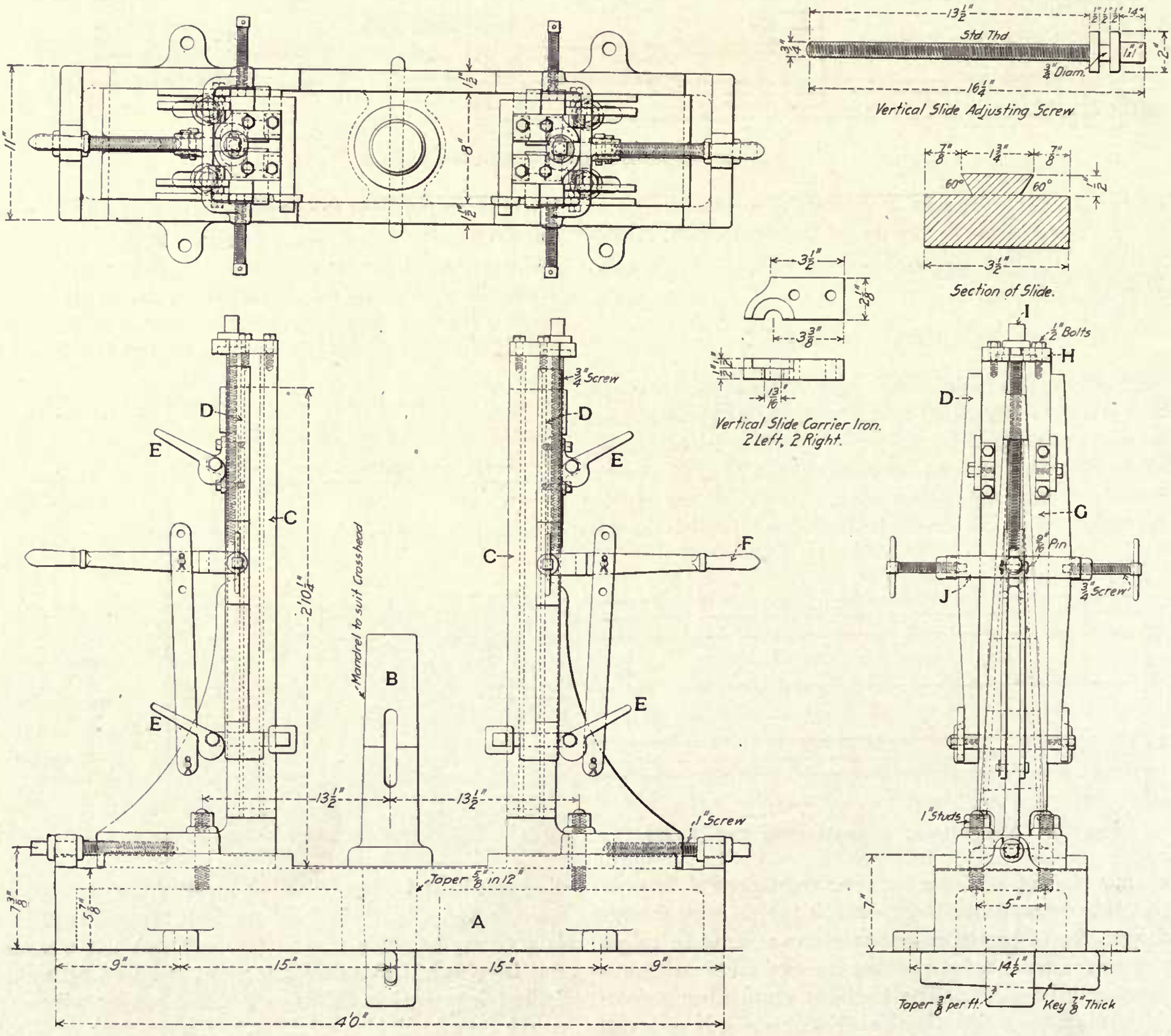



**Fig. 500—Crosshead Babbitting Machine.**

shops, but duplicates have been made for other shops on the road.—*Norfolk & Western, Roanoke, Va.*

### CROSSHEAD, BABBITTING.

With the device shown in Fig. 501, the crosshead shoe, after being removed from the crosshead, is clamped to the mold. It is stood on one end and the babbitt is poured. The shoe is then ready to be replaced on the engine without any machine work, from 15 to 20 minutes being required for the entire operation. This is much more satisfactory than the former practice, which was to fill the shoes with babbitt over blocks slightly smaller than the guide and plane them to size. At the smaller engine houses, which were not equipped with planers, it was necessary to replace the shoe with one which had already been babbitted and was carried in stock. This arrangement was not entirely satisfactory, for the reason that the shoes usually required some fitting of the bolts because of the holes not lining up properly. All of our engine houses are equipped with these molds.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

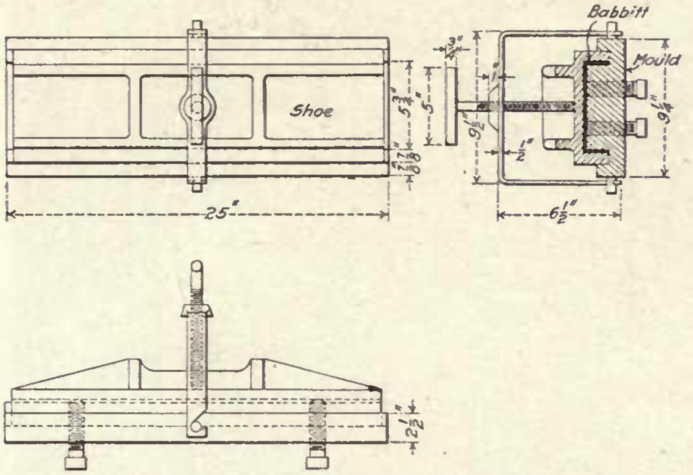



Fig. 501—Mold for Babbitting Crosshead Shoes.

### DRIVING BOXES, BABBITTING.

The driving boxes are babbitted in shallow cast-iron pans. The box is inverted in the pan and the latter, which is the proper depth for the desired thickness of the babbitt, is filled with the metal. It is said to save about 75 per cent. in time as compared to the putty-and-sheet-iron method which was formerly used.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

### DRIVING BOXES, BABBITTING.

The babbitting jig shown in Fig. 502 affords an easy means for babbitting the faces of driving boxes to any desired thickness. To apply the jig, first fasten the cross piece *A* to the box by passing the cellar bolts through the holes provided; then force the jig into the top of the journal bearing by means of the screw *B*. The cover plate *C* will then extend over the face of the box and may be adjusted by the screw *F* to give the required thickness of babbitt. The clamp *D* holds this in a rigid position. The babbitt is poured through the tap holes in the plate and is prevented from flowing away by a gum band *E*, which extends around the outside of the cover plate, together with a little clay packed around the outside of the gum band. This device has lightened the work on the boring machine on which it was formerly necessary to face off the excess metal.—*R. G. Bennett, Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

### DRIVING AND TRUCK BOXES, BABBITTING.

The former practice at Mt. Clare was to babbitt the hub faces of driving and truck boxes in the machine shop. No particular arrangement was provided for leveling up the boxes, so that a large amount of time was consumed in leveling up each individual box. This work is at present handled on a platform just outside the erecting shop. At the edge of the platform, between it and the wall of the shop, two rails are laid about 10 in. apart on a concrete foundation. The boxes are trucked from the shop to this platform and placed directly on the parallel rails. No further leveling up is necessary. Engine truck boxes are handled in a similar way. This has caused a considerable reduction in the time required for babbitting boxes.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

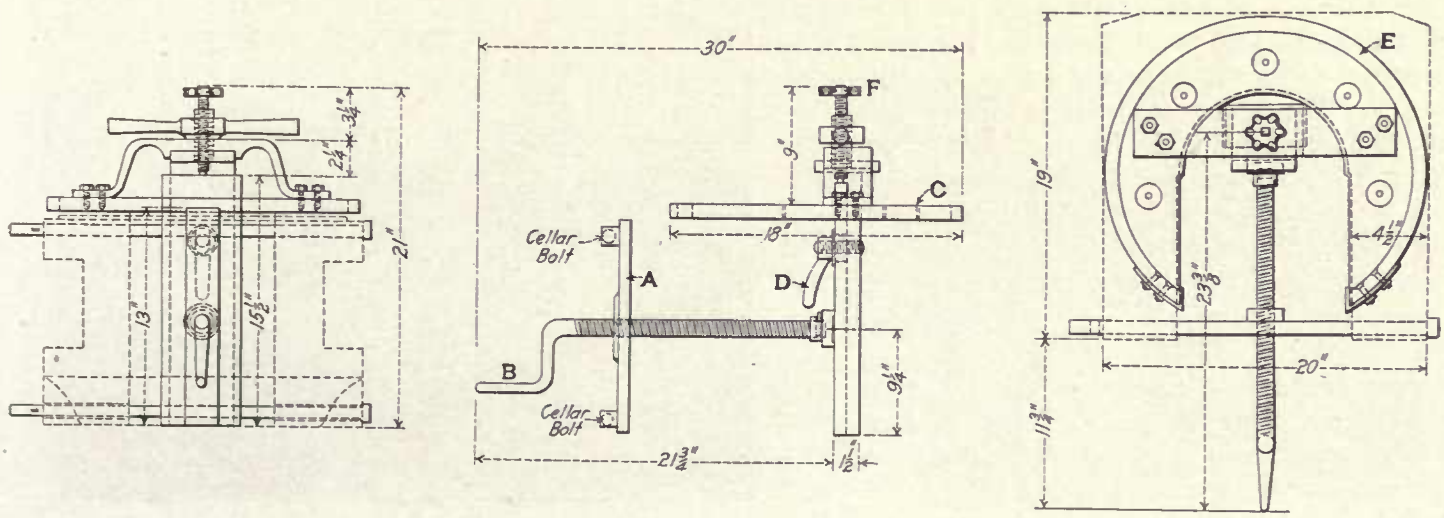



Fig. 502—Jig for Babbitting the Faces of Driving Boxes.

### FURNACE, GAS.

A simple and durable gas furnace used for pipe bending and brazing in the engine house is shown in Fig. 503. The box, which is 6¾ in. high and about 24 in. x 10 in. inside, may be made either of cast iron or of iron plates. It is partially lined with fire bricks as shown. The gas which enters the 1-in. tee through the 1-in. pipe is mixed

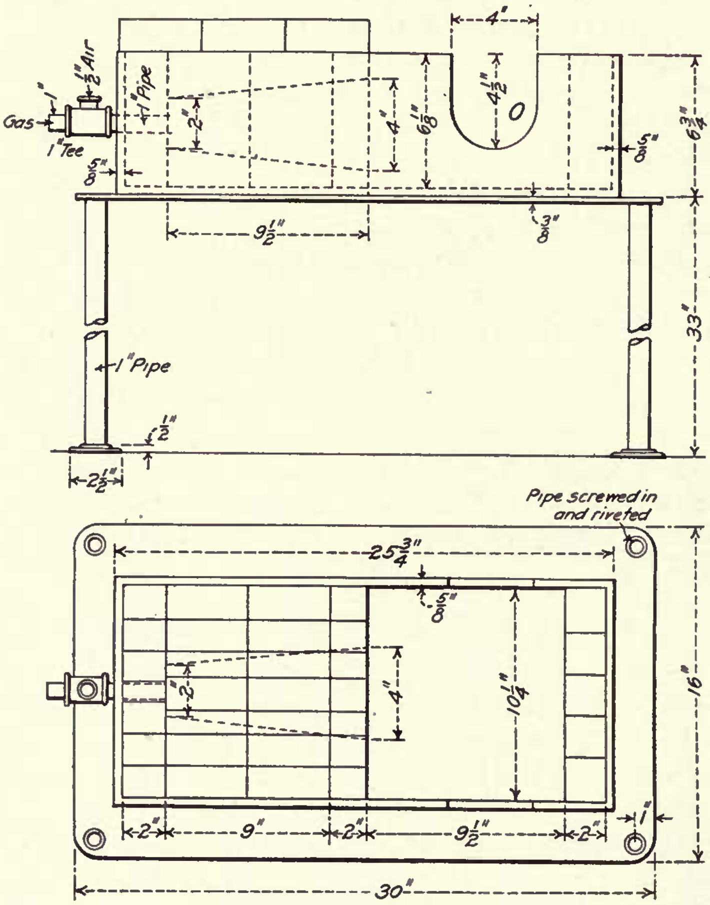



Fig. 503—Gas Furnace for Pipe Bending and Brazing.

with air, which enters through the ½-in. pipe; this mixture is forced into the furnace through the 1-in. pipe, the opening in the fire brick increasing in diameter from 2 in., where the gas enters, to 4 in., where the fire brick ends near the center of the furnace. That part of the pipe which is to be heated is laid across the furnace in the depression *O*, where the heat is intense. Fire bricks protect the back wall of the furnace. The gas is used at a pressure of about 6 oz., and the air at about 70 lbs. per sq. in. The furnace is placed on an iron plate ⅜ in. thick, 16 in. wide and 30 in. long, which is supported on four legs of 1-in. pipe. The device is comparatively light and if desired may be moved about the engine house if suitable air and gas connections are provided.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### GASKET PUNCH.

Copper gaskets are made with the punch shown in Fig. 504, on a slotter in the tool room. The lower die block is clamped to the bed of the machine, while the upper one, carrying the two punches, is held in the sliding head. The two punches provide for making a gasket at each stroke of the machine. The sheet copper is fed in at one side; the small hole is punched first and the

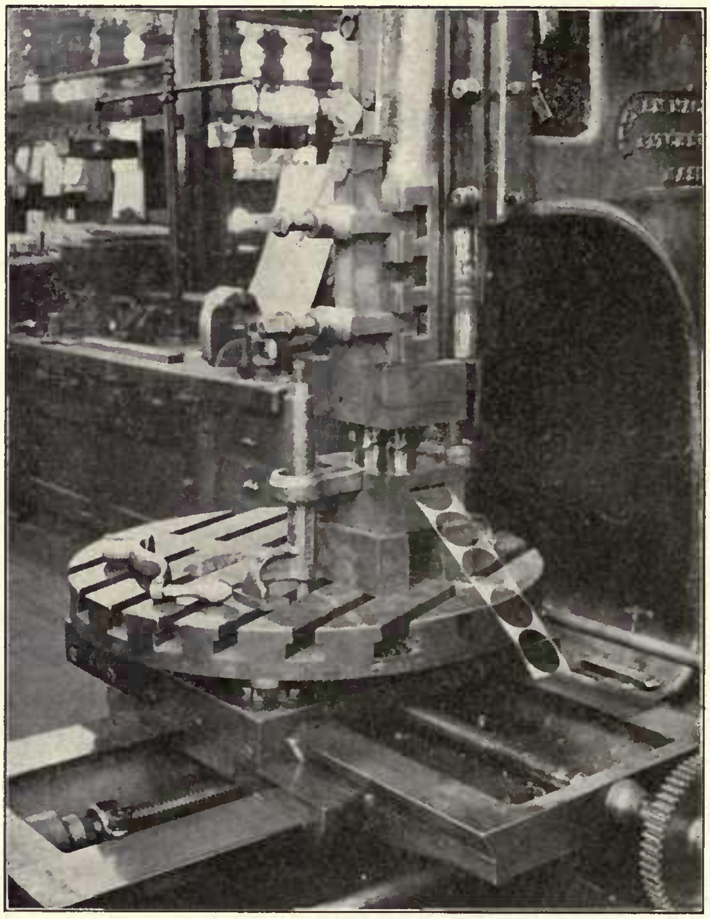


Fig. 504—Punch for Copper Gaskets, as Used on a Slotter.

large one next, after which the gasket falls through to the table. There is a small stop provided on the side from which the sheet is fed, which acts as a guide to punch the two holes concentric.—*Lehigh Valley, Sayre, Pa.*

### JACKET IRON ROLLS.

A set of rolls used to form the curved part of jackets for boiler heads is shown in Fig. 505. All of the Southern Pacific locomotives have their boiler heads covered with lagging jackets. Ordinarily planished iron is used,

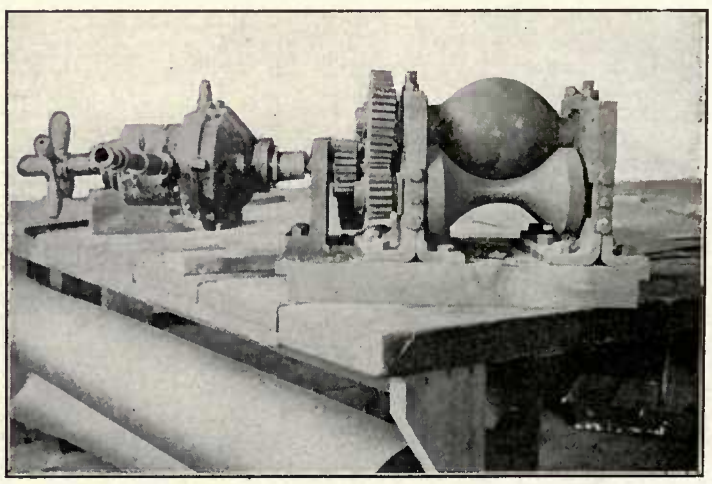


Fig. 505—Rolls for Jacket Iron.

and forming the round part by hand was a considerable job. The rolls are operated by an air motor, and a variety of radii may be obtained by adjusting them. It will be noticed that heavy gears are required.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and C. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

### JOURNAL BRASSES, ENGINE TRUCK, BABBITTING.

Engine truck box brasses are babbitted by means of the hollow mandrel shown in Fig. 506. The projection, 1 in. wide at the top, lays against the crown of the brass

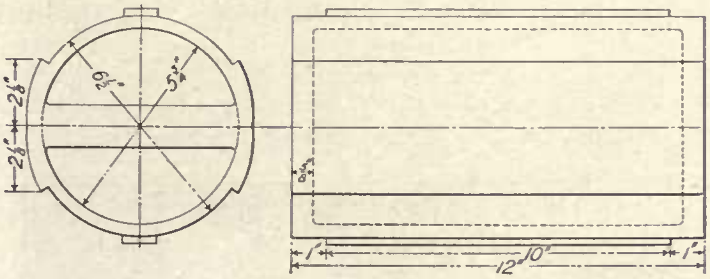


**Fig. 506—Jig for Babbitting Engine Truck Brasses.**

and protects the oil groove. In the same manner the lip at the side fits against the side of the brass at the point where the babbitt stops.—*Delaware, Lackawanna & Western, Scranton, Pa.*

### OIL PIPE, REPAIRING WITHOUT BRAZING.

The accompanying drawing, Fig. 507, shows the connection and tools used for repairing broken oil pipes without brazing in the engine house on the Rutland. The usual procedure in such cases is to apply an outside oil pipe until the engine is placed in the back shop, but this is very unsatisfactory. To obviate this the following method is used: The first operation is to raise the jacket and cut-off the old pipe back of the break and slip the sleeve *A* over the pipe. Then the split nut *B* is applied, allowing the pipe to extend 3/32 in. beyond the end, as shown in the upper view in the illustration. Tighten nut *C* until the sleeve grips the pipe. Then, with tool *D* bend over the pipe, as shown; release the nut *B*, draw the sleeve *A* up to place and connect the new piece of pipe *E*

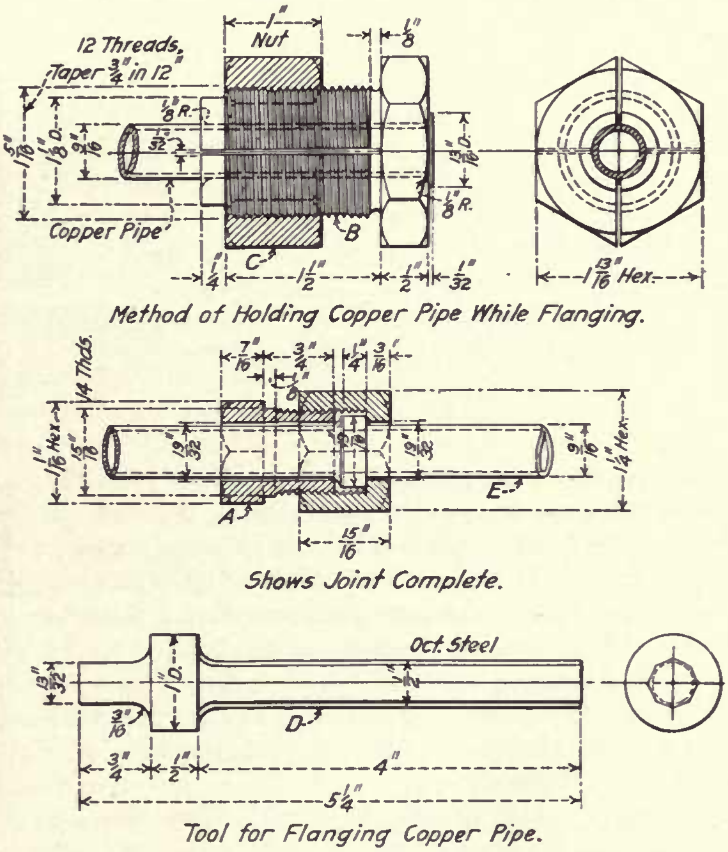



**Fig. 507—Connection and Tools for Repairing Broken Oil Pipes in Engine House Without Brazing.**

which has previously been made for stock. Repairs of this kind have been made complete in 27 minutes.—*Thomas Moriarty, Pipe Fitter and Coppersmith, Rutland Railroad, Rutland.*

### PACKING RINGS, MOLDING.

The machine for molding packing rings, shown in Fig. 508, consists of a 3-in. air cylinder which is controlled by

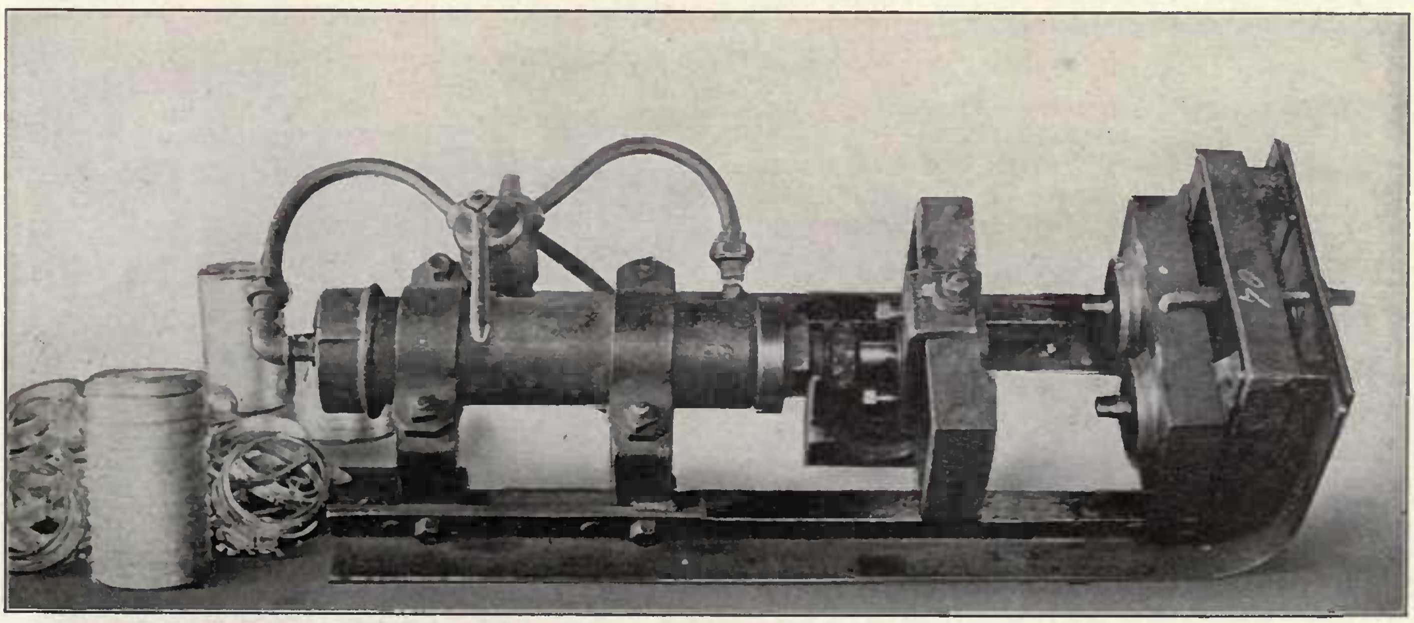


**Fig. 508—Machine for Molding Packing Rings.**

a three-way cock. The cylinder is bolted to a frame constructed of angle iron; a yoke at the end of the piston rod is attached to the female former, the male die being fastened to the frame. The rings when removed from the mold are finished except that it is necessary to clip off and file down the lug formed by the gate for pouring. Finished packing rings are shown at the left. The outfit is equipped with a complete set of dies for the different sizes of piston, valve and air pump packing. The photograph shows the device tilted on one side to better illustrate its construction and operation.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic, and Henry Holder, General Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

ROOFING ROLLS AND CUTTER.

Pneumatically operated rolls and a cutter used for shaping and cutting freight car roofing material are shown in Fig. 509. The form at the extreme right of the roll cylinder is used for shaping the ridge pole sheet. The other four are used as one form in shaping the roof sheets. The roofing sheet cutter at the left has an air cylinder mounted on a metal cross-piece that is bolted to the two uprights, which also act as guides for the cross-head carrying the blade. The contour of the blade edge is shown, as is the shape of the cut sheet, one of these being placed on edge below the lower knife.—*Lehigh Valley, Sayre, Pa.*

STAMPING PRESS, DIES FOR.

A set of dies for stamping gaskets for the top, bottom and center heads of a 9½-in. air pump is shown in Fig. 510. The dogs, *A*, *B* and *C* in the male die are removable, thus allowing the stamping of three different types of gasket with these dies. Another set of dies for stamping the copper water strainer for feed water pipes is shown in Fig. 511. These dies are made of tool steel and are used in a No. 2½ double stripper machine manufactured by the E. W. Bliss Company, Brooklyn, N. Y.—*Chicago & North Western, Chicago.*

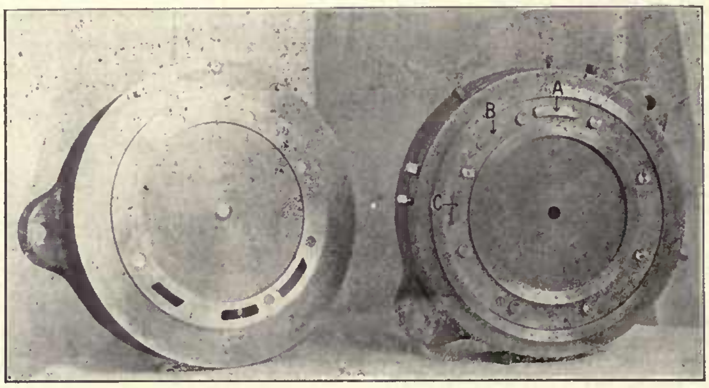



**Fig. 510—Dies for Stamping Gaskets for Air Pump Heads.**

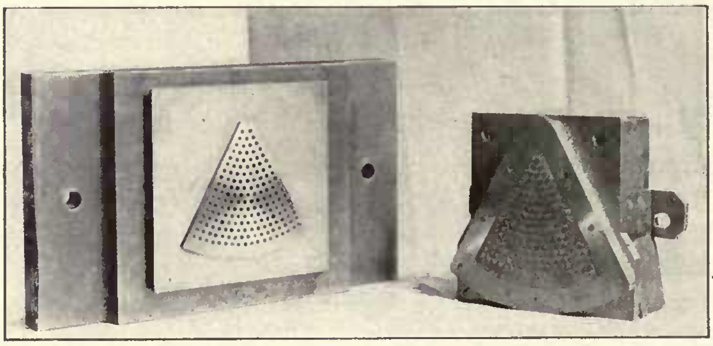


**Fig. 511—Dies for Stamping Copper Water Strainers for Feed Water Pipes.**

TOOLS AND MATERIAL, CHECKING.

The system of material and tool checking used in the tin and pipe shop at Mt. Clare is a departure from that

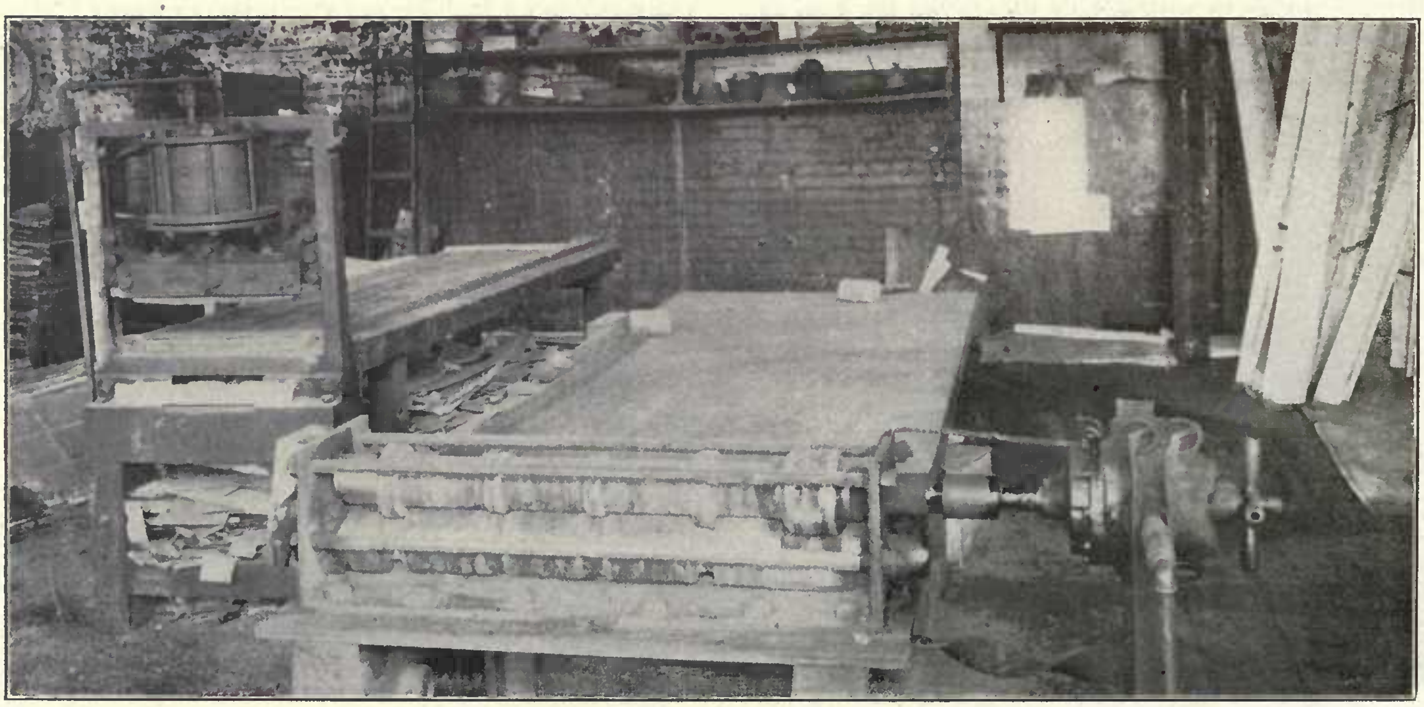


**Fig. 509—Cutter and Rolls for Roofing Material.**

ordinarily used. A case is provided containing 200 pigeon holes, each 2 in. x 2 in. x 4⅞ in. When a man desires a tool, he writes its name on a 1¾-in. x 4¾-in. ticket and signs it. Before delivering the tool, the attendant gives the mechanic its number and this, as well as the date, is marked on the ticket. Each tool is also stamped "Pipe Shop" in large letters. This prevents its being turned in at other tool rooms by mechanics, with whose tools it may have been gathered up in other shops. The lower portion of the case is alphabetically arranged, and the ticket is deposited in a pigeon hole under the letter of the mechanic's name. When the tool is returned to the tool room the card is given to the mechanic, who destroys it and places the pieces in a box inside the tool room window placed there for that purpose. All tools are returned at closing time each day, and if needed again are drawn out on the following morning.

With this system there is no chance for exchanging tools among the workmen as all are numbered and when returned must correspond to the number and kind of tool drawn. For instance, a man drawing a 14-in Stillson wrench, No. 41, must return the same tool, and is prevented from substituting another wrench, although it be of the same kind. This rule, of course, also applies to stocks, dies, cutters, monkey wrenches, screw drivers, chisels, hammers, chain tongs, and all tools used in the pipe shop.

Another good feature of this system is that when tools are lost or mislaid the mechanic can get the tool's number at the tool room, and make a systematic search for it, at the same time notifying the tool room attendant that he has lost or mislaid the tool. It is then listed on the "lost tool sheet," and the tool room attendant watches for it. The result is that but very few tools are lost.

The case is also used to record all material charges to locomotives, cars and general shop orders and effectually prevents wrong charges being made. An instance in point was illustrated when a man gave a locomotive number which did not correspond to any locomotive in the shop at that time. He had transposed the figures, but his mistake was immediately noticed by the tool room attendant. The upper portion of the case is reserved for orders of this kind. When it is desired to get material from the storehouse the man writes a list of the material required on a ticket with the proper designation number. The tool room attendant compares this designation with the numbers in the case, and if it does not appear, the man asking for material is required to correct it. An order is written on the storehouse material card by the tool room attendant, who gives this order to the workman wanting the material, and files the original ticket in the case. By this method charges are correctly kept, no improper charges being permitted to pass the tool room window. When the shop, locomotive or car order is closed, the tickets are placed on file for future reference. This system was devised by Wm. Magee, foreman pipe shop, who supplied the description given above.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

# Engine House Kinks

AIR PUMP HOIST.

A simple hoist for removing and applying air pumps is shown in Fig. 512. It consists of the strut *B* of 1-in. round iron, a ¼-in. chain *C* with a hook at each end, and a ½-ton differential block. To remove an air pump, the strut *B* is placed on top of the pump bracket, as shown, and its upper end is connected to the handrail by means of the ¼-in. chain *C*. The length of this chain may be adjusted by means of the hooks at each end. The ½-ton differential block is then attached to the upper end of the strut; the reverse valve chamber cap is replaced by the lifting eye *A*, and the hoist is ready for use. While the parts are of sufficient strength, the weight is a minimum, and one man can carry the apparatus from the tool room to the engine in one trip, which takes on an average about

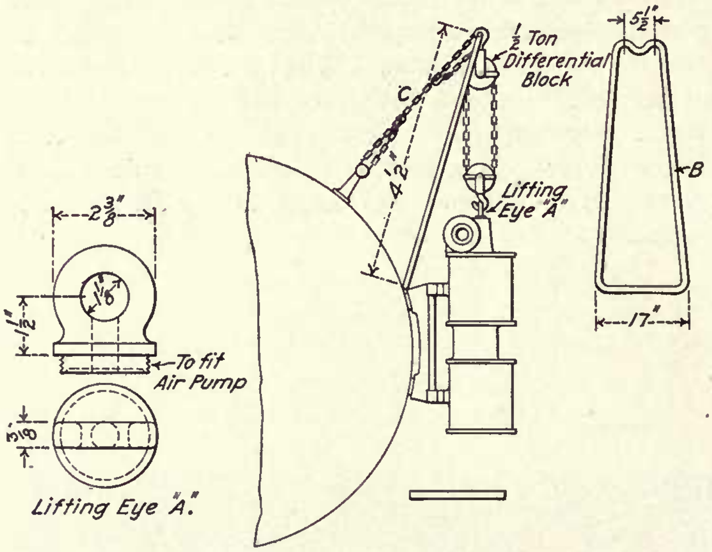



Fig. 512—Hoist for Removing and Applying Air Pumps.

four minutes; after arriving at the engine he can set it up in half a minute, making a total of 4½ minutes to have it ready for use after leaving the tool room. The same amount of time is required for removing and returning it. Where a hoist of this kind is not used, the ordinary method is to remove the pumps by means of a timber about 20 ft. long, clamped to the back edge of the roof of the cab. Two men are required to handle the timber, and it usually requires about 38 minutes to transport it to the engine and apply it, and 20 minutes to remove and return it. The new device is, therefore, about ten times as efficient as the ordinary method.—*C. J. Lindgren, Roundhouse Foreman, Chicago, Burlington & Quincy, Aurora, Ill.*

BENDING ROLLS FOR LIGHT WORK.

A simple bending rolls for light work in an engine house, such as forming the petticoat pipes or for use as a clamp when flanging a baffle plate, is shown in Fig. 513. Not being located near the main shops, where we could have access to the rolls in the boiler or tank shop, we find it indispensable. The top roll is made of standard

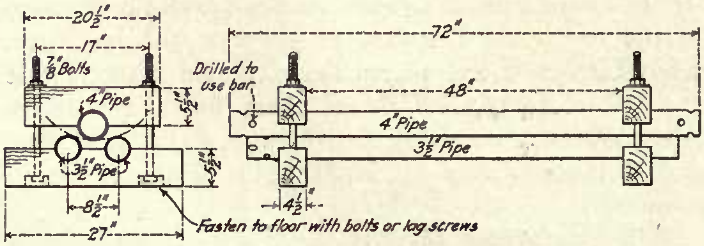



Fig. 513—Bending Rolls for Light Work.

4-in. wrought iron pipe, and the lower ones of 3½-in pipe. The rolls rest on 4½-in. x 5½-in. oak blocks, which are fastened to the floor by lag screws. They are revolved by using an ordinary bar in the holes at the end of the pipes.—*B. N. Lewis, Roundhouse Foreman, Minneapolis, St. Paul & Sault Ste. Marie, Enderlin, N. D.*

BOILER CHECK REAMER.

A hand reamer for truing worn seats of boiler check valves is shown in Fig. 514. The check, outlined in the illustration, for which this reamer was designed, has a flat seat, the outside diameter of which is the same as the diameter of the hole in the check body through which the cutter must be inserted. It is necessary, therefore to

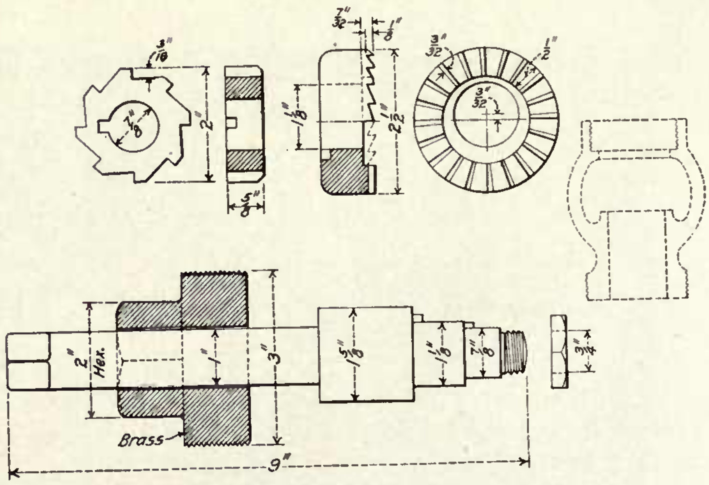



Fig. 514—Boiler Check Reamer.

have an offset cutter so as to provide a sweep, when the tool is in operation, sufficient to extend over the entire seat face. The brass nut screws into the threads of the valve body and acts as a guide for the spindle. There are two cutting tools, both of which are used at the same time. The 2½-in., or main seat cutter, is offset 3/32-in. The 2-in. cutter, which removes the scale from the bore of the valve below the seat, also acts as a guide for the spindle. The reamer is operated with a ratchet or single end wrench.—*Fred Bentz, Tool Room Foreman, Southern Pacific, Bakersfield, Cal.*

### BOILER CHECK REAMER.

A device for reaming the joints of a branch pipe or injector check ball joints is shown in Figs. 515 and 516.

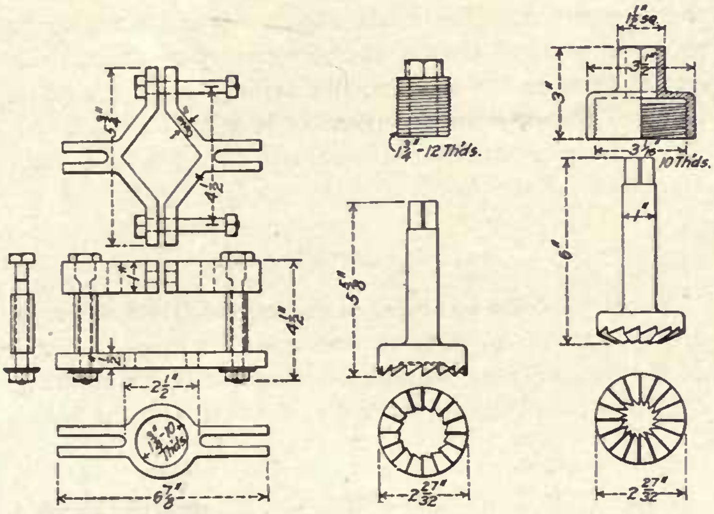


Fig. 515—Details of Check and Branch Pipe Joint Reamer.

These joints often become so damaged that it is necessary to machine them, and this device was designed by Fred Bentz, tool room foreman at Bakersfield, so that the

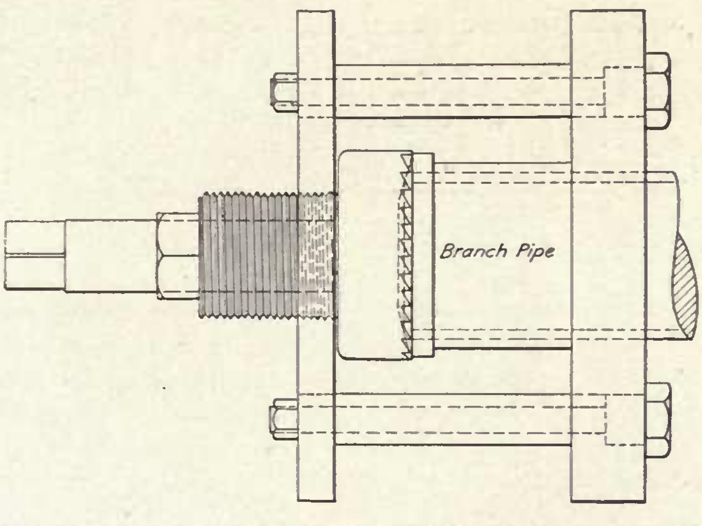



Fig. 516—Assembled View of Check and Branch Pipe Joint Reamer.

joints could be repaired without removing the check or pipes from the locomotive. The assembled view shows the device in place on a branch pipe.—*Elmo N. Owen, General Foreman, Southern Pacific, Bakersfield, Cal.*

### BOILER CHECK VALVE LIFTER.

The device for reseating check valves shown in Fig. 517 can be made at an expense of about $1.50. The sticking of boiler checks is one of the chief troubles in a roundhouse, and is especially annoying and expensive if it happens when a locomotive is ready to go out. The simplicity of this device is at once noticeable, both as to its design and its use. The branch pipe is disconnected, the device placed as shown and the handle operated until the scale or other foreign matter, which holds the check

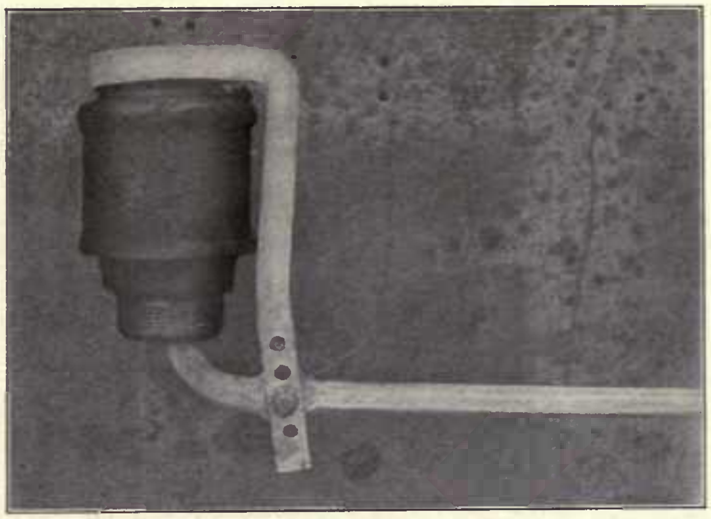


Fig. 517—Device for Reseating Check Valves.

valve from its seat, is released and blown out. It often saves the expense of knocking the fires and blowing off boilers to repair the check.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.*

### BOILER CHECK VALVE LIFTER.

A very handy check valve lifter is shown in Fig. 518. The drawing shows the lifter as used on a consolidation engine check valve with a flat seat. Often after the engine is steamed up a chip or piece of scale lodges under the valve and prevents its closing. The check lifter is then used allowing the obstruction to be blown off the

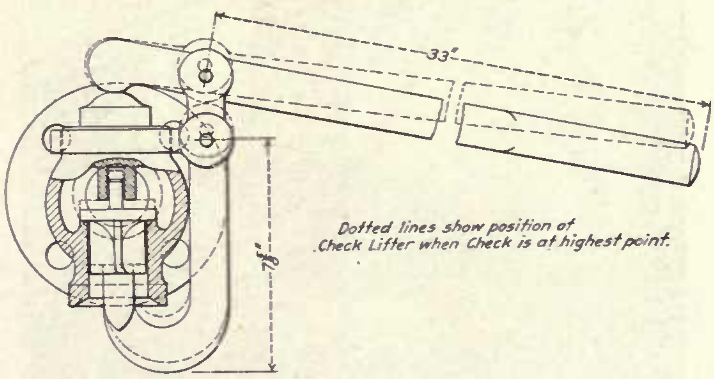



Fig. 518—Check Valve Lifter.

seat. It is applied by merely disconnecting the branch pipe. With this lifter it is possible to open a check against 200 lbs. steam pressure.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and C. H. Goodwin, General Gang Foreman. Southern Pacific, Los Angeles, Cal.*

### BOILER TEST HOSE, SAFETY CLAMP FOR.

A strong safety clamp for the hose which is used for testing locomotive boilers in the engine house, is shown in Fig. 519. The large end of the clamp, which is made of wrought iron, fits over the hose, while the small end clamps over the nipple. Two of these double clamps are used—one where the hose is connected to the engine

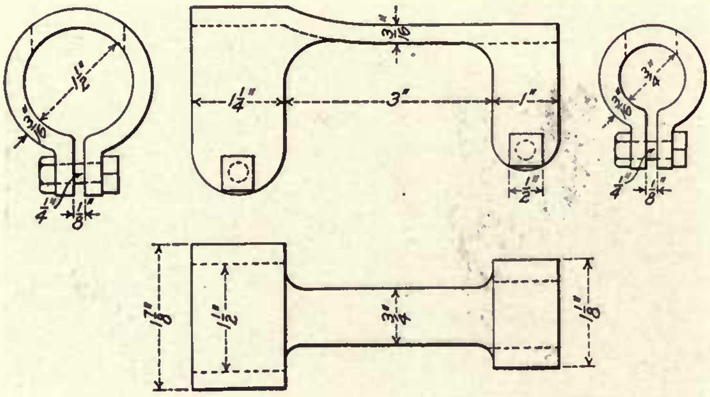


**Fig. 519—Safety Clamp for Boiler Test Hose.**

house test line, and the other where it is connected to the boiler.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

BOILER WASHER, PLATFORM FOR.

A large amount of time and labor are ordinarily expended in arranging temporary platforms for washing over the crown sheets and tubes of locomotive boilers. This is especially true in bad water districts, where the

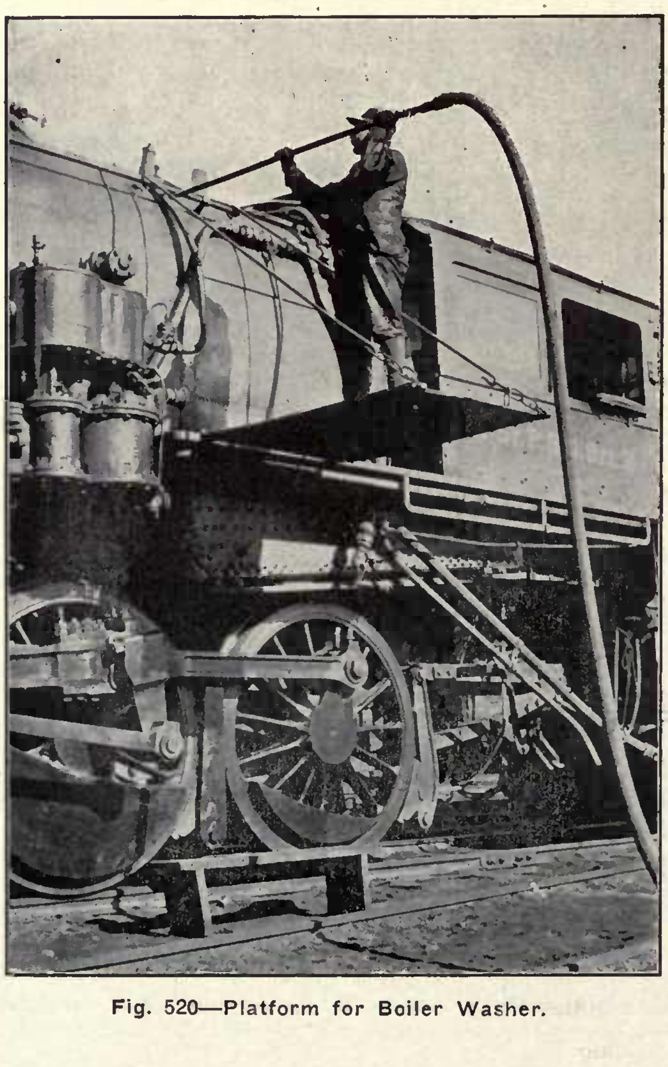


**Fig. 520—Platform for Boiler Washer.**

boilers have to be washed after every trip. A light platform for this purpose, which may be easily adjusted, is shown in Fig. 520. It is 3 ft. wide and 5 ft. long, and is made of two strips of ⅜-in. x 1½-in. iron, to which a ⅞-in. x 5-in. matched pine floor is secured with bolts. Loops are formed at the outer ends of the iron strips, which may be connected to the hand rail by two ⅞-in. round iron rods made with a hook at each end, and the two pieces of chain each having four links, as shown in the illustration. The chain allows the platform to be properly adjusted for the different classes of locomotives. At the other end of the platform the iron strips are offset to catch the edge of the running board.—*B. N. Lewis, Roundhouse Foreman, Minneapolis, St. Paul & Sault Ste. Marie, Enderlin, N. D.*

BOILER WASHER'S CART.

A cart for boiler washers in the engine house is shown in Fig. 521. It is made of steel and is arranged to hold all the necessary tools and equipment for boiler washing. The hose is carried on the reel at the rear, and the boxes,

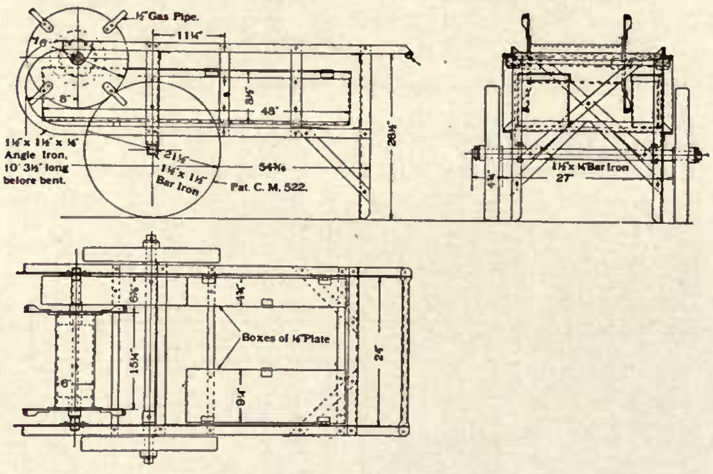


**Fig. 521—Cart for Boiler Washers.**

arranged along the inner sides of the cart, carry the various wrenches, nozzles, etc. Locks are provided for the boxes so that the equipment is kept in the cart rather than in various cupboards or the tool room.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

BOILER WASHING.

We use the Miller boiler washing system. The steam and hot water are blown into a heater and the boiler is washed out with water at about 130 deg. Fahr., after which it is refilled with water at 180 deg. Fahr. The washout hose remains connected to the washout line at all times, unless it is desirable to change it from one pit to another. Formerly we used a hose for connecting the blow-off and the filling up lines to the boiler, but we had so much trouble in maintaining it that we applied the ball joint pipe, shown in Fig. 522. This has given good satisfaction; in changing it is only necessary to loosen up the nut and change the connection from one pipe to another. We have several of these connections to suit the blow-off cocks on the different classes of engines. It takes 14 minutes to blow out a wide firebox boiler of a locomotive having 21-in. x 28-in. cylinders, through the 2-in. blow-off cock, and about seven minutes to refill it. We blow off the boiler, wash, refill, start the fire and have up 40 lbs. of steam in about one hour and 10 minutes.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

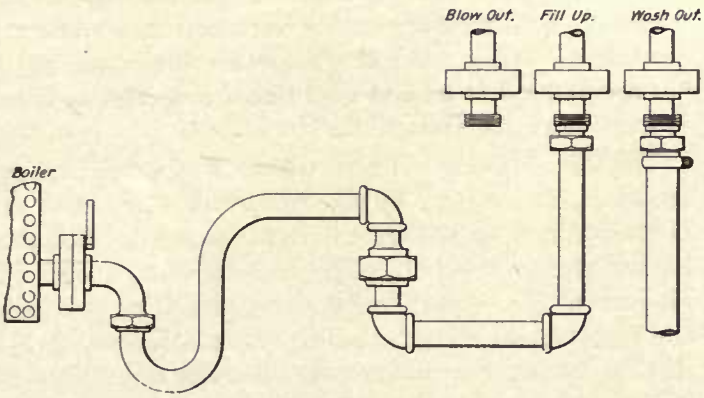



**Fig. 522—Ball Joint Pipe to Connect Blow Out and Filling Up Lines of Boiler Changing System.**

CINDER CART.

A cart for cinders and rubbish is shown in Fig. 523. The box is constructed of No. 10 tank steel and 1¼-in. x 1¼-in. x 5/16-in. angles with ¾-in. half round at the top on the outside. The frame and the handles are of wood. The box is 54 in. long, 30 in. high, and 22 in. wide at the bottom and 32 in. at the top. The door at the front facilitates unloading. The wheels are 21 in. in diameter.—*C. P. Wilkinson, Apprentice Instructor, Michigan Central, Jackson, Mich.*

**Fig 523—Steel Cart for Cinders and Rubbish.**

CRANE, PORTABLE 1½ TON.

A portable 3,000-lb. crane, which may be used to advantage in either the engine house or the erecting shop, for such work as handling steam chests and covers, cylinder heads, guides, crossheads and bumper beams, is shown in Fig. 524. The base of the crane, which is mounted on the wheels, is a heavy iron casting, the general design of which is shown in Fig. 525. The front axle is pivoted at the center and is offset; the handle is rigidly fastened to this axle and when it is raised the front of the bed drops until the lugs *A* rest on the floor, thus steadying the crane. The upper frames, *B*, of cast iron, are securely bolted to the base and are reinforced by the ½-in. x 2-in. iron straps which pass through the lugs, *S*, at the upper and lower part of the frame. The chain runs on the drum, *D*, and passes over the sheave *C*. A ratchet and pawl are provided for locking the drum and thus holding the load at any height.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

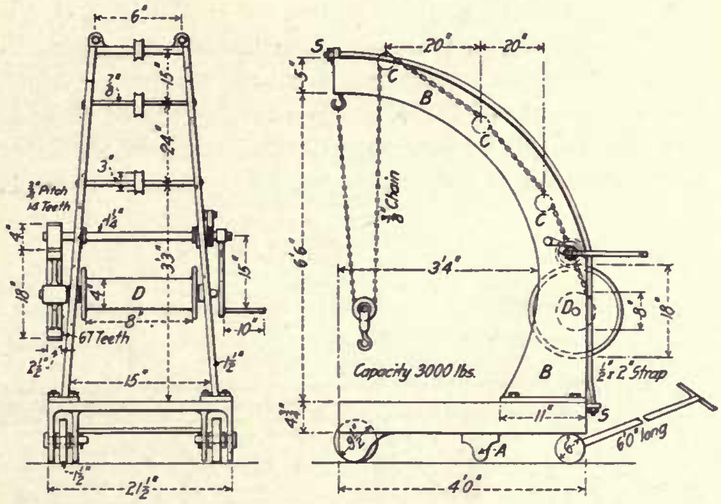



**Fig. 524—Portable 1½-Ton Crane.**

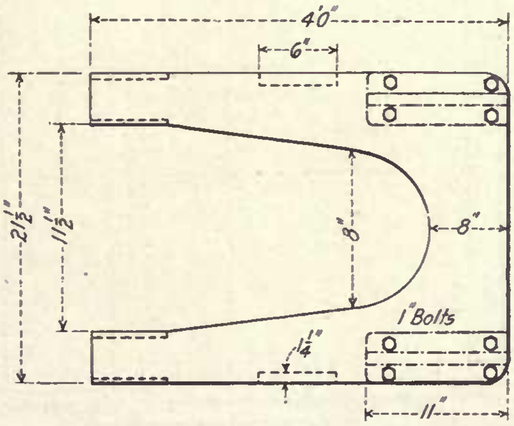



**Fig. 525—Cast Iron Base of Portable 1½-Ton Crane.**

### CINDER PIT HOIST.

The efficient operation of an engine house depends to quite an extent on the facilities that are provided for handling ashes and cinders at the ash pits. An admirable arrangement for doing this is shown in Fig. 526. The framework for the hoist is supported on a substantial concrete foundation, and consists of 12-in. channels, 20 lbs. per ft., at the sides, securely braced by angle irons and straps as shown. The top cross members of the framework are 12-in. I-beams, 32 lbs. per ft. The framework extends over two tracks; one at the ash pit and one for the cinder cars. The construction of the ash pit is clearly shown on the drawing. The number of ash buckets, *B*, which are supported on the four-wheel trucks, *C*, depends on the length of the ash pit and the service which is required of it. When one of the buckets, *B*, has been filled and run underneath the framework the overhead hoist, which is supported from the small truck which operates on top of the 12-in. I-beams, is placed directly over the ash pit by manipulating the handle of the valve on the column at the side of the pit. Valve *V* controls the admission of air into the cylinder *D*, which is fastened to the side of the framework. By the system of pulley-wheels *T*, one of which is fastened to the end of the piston rod of cylinder *D*, and by means of a wire cable which passes over these pulleys, and which is fastened to the truck, *H*, the latter may readily be moved back and forth over the two tracks at will. To steady the piston rod it has a crosshead at its end which runs in guides fastened to the side of the framework.

The 9-in. hoisting cylinder which is supported by the truck, *H*, is operated by the three-way valve, and the piston rod may be allowed to drop to such a position that a hook at its end may be engaged with a link on the ash pit bucket. The bucket may then be lifted from the truck, and by operating the valve which controls the cylinder, *D*, may be transferred directly over the ash car. Then by raising and lowering the bucket slightly and allowing the upper end of arm *A* to strike the heavy iron ring *R*, which is rigidly fastened to the bottom of the cylinder head, the two halves of the bucket may be made to open outward, allowing the ashes to fall in the car. Allowing

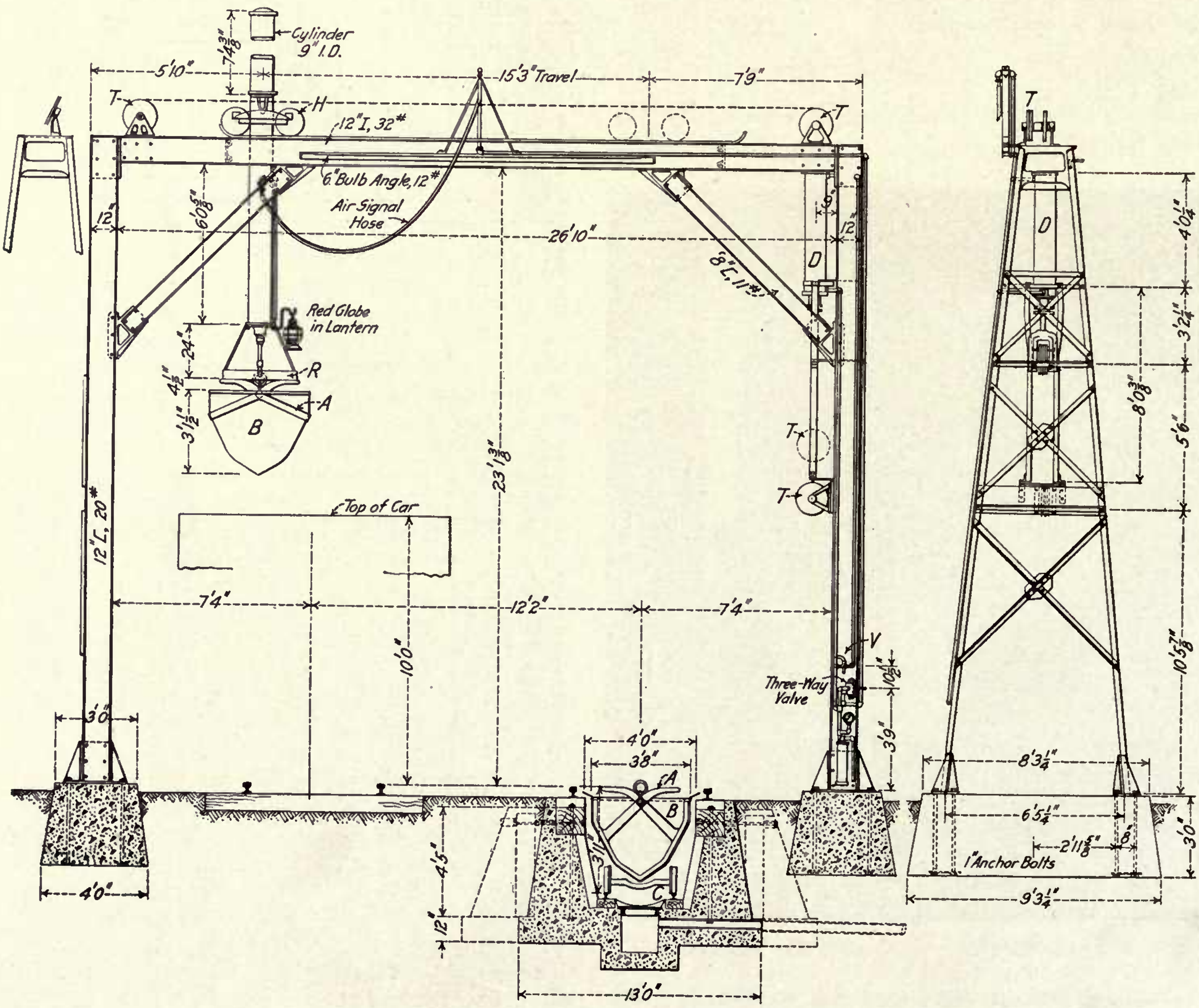



**Fig. 526—Pneumatic Hoist at Cinder Pit.**

the piston to drop slightly closes the bucket again and it may then be moved over and dropped onto its truck, and another truck with a full bucket may be run under the hoist and be dumped in a similar manner. The carriage of the truck *H* is fitted with a cast iron yoke which allows the cylinder to swing a considerable distance in any direction. The ash bucket trucks are constructed of 2½-in. x 2½-in. angle iron, and have heavy forged axles with cast iron flanged wheels.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

CRANE, SMOKE STACK.

The smoke stack crane, shown in Fig. 527, does not differ greatly from what has become everyday practice in the large majority of shops, but at the same time is a design which has proved very efficient. It is made of wrought iron and is very light and easily handled. When applied to the stack it may be easily swung around in any

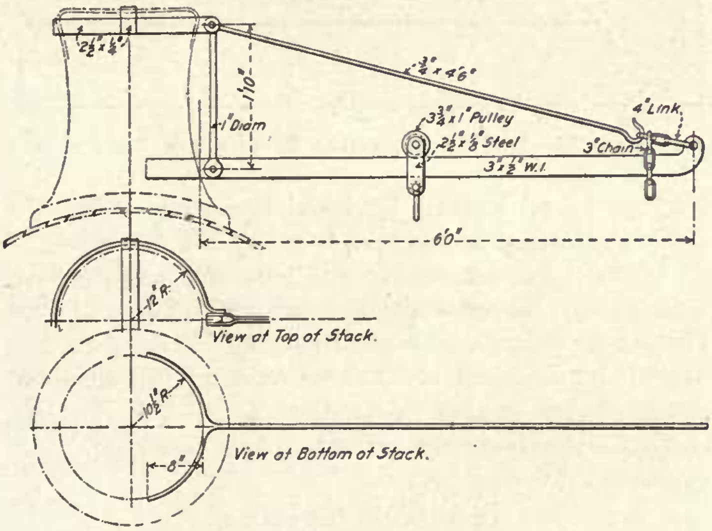



**Fig. 527—Locomotive Stack Crane.**

position. The arm or beam is forged from a 3-in. x ½-in. wrought iron bar and is stayed by the ¾-in. iron rod which is connected by a pin to the 2½-in x ¼-in. collar at the top of the stack.—*A. D. Porter, Shop Efficiency Foreman, Canadian Pacific, West Toronto, Canada.*

CRANE, SMOKE STACK.

A handy and inexpensive crane for lifting steam chests and covers, cylinder heads, pistons and front end work is shown in Fig. 528. The arm is made of a 6-in. I-beam taken from an old brake beam. The upper part of the beam forms a runway for a roller from which the hoist is suspended. The inner end is clamped to the top of the smokestack, as shown. The clamp may be made of any length to suit the height of the stack. In adjusting it, the crossbar, *X*, is tipped up and dropped down through the stack. As it is evenly balanced, it takes a horizontal position after it has dropped through the stack. The beam can then be applied and be clamped in any position by the screw at the top. While the device is light enough to be handled easily, it is sufficiently strong for the work which may be required of it. In removing the crane, the screw is slacked off and the I-beam is taken out. The clamp is then lowered sufficiently so that with the use of a long stick the piece *X* can be tipped and be drawn up through the stack. An important feature of the crane is

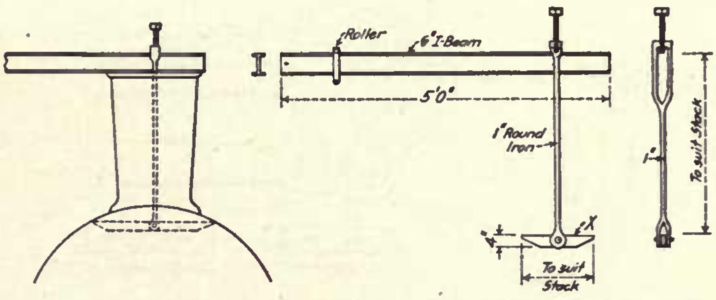



**Fig. 528—Simple Crane for Front End Work.**

that the beam is placed high enough above the work, so that the tackle blocks do not come together.—*H. L. Burrhus, Assistant to General Foreman, Erie Railroad, Susquehanna, Pa.*

CRANE, SMOKE STACK.

The light stack crane, Fig. 529, is made of wrought iron, the trolley rail being ¾-in. x 2½-in. bar iron, to which is welded a rod 1 in. in diameter that extends back to and down the top of the stack. The trolley rail has a forked end to fit the base of the stack

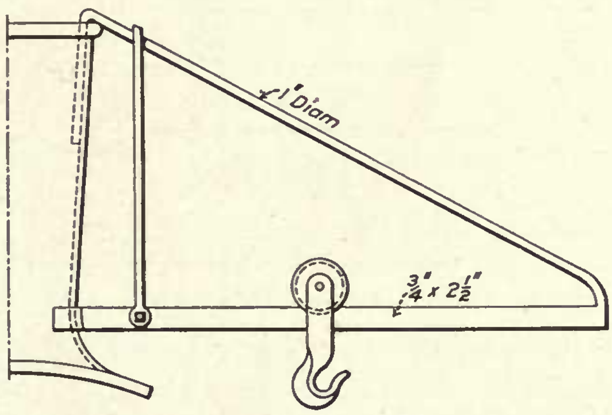



**Fig. 529—Stack Crane.**

and carries a trolley wheel with a suitable hook for attaching a block and fall. This device is used for lifting steam chests, pistons, cylinder heads, etc. It is handled by one man, who can thus do the work formerly done by three men.—*A. S. Willard, Foreman, Norfolk & Western, Crewe, Va.*

CROSSHEAD LINER, APPLYING.

A simple method of applying a lost liner to a crosshead without taking down the main rod and crosshead is shown in Fig. 530. The liner is slipped into position between the guide and the crosshead, and the holes are marked off. It is then removed and the holes are drilled and tapped, after which the liner is replaced and a copper rod with threads on one end is screwed into the hole and is cut off to allow ¼ in. for riveting over on the outside of the crosshead. In performing this latter operation the crosshead is wedged on the other side of the guide, so as to draw the liner, which is being riveted, close to the guide. Liners may be applied in this way in about an hour, and I have often seen them run until the engine went to the

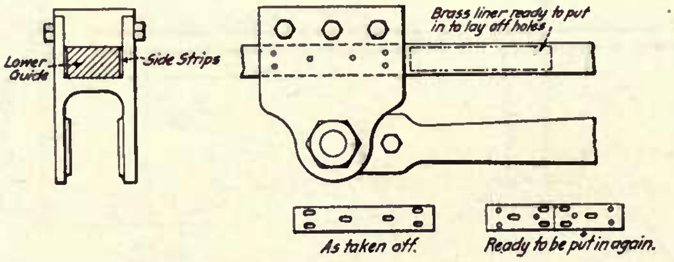



**Fig. 530—Applying a Liner Without Taking Down the Crosshead.**

shop for overhauling. A liner that has become loose, and in which the rivet holes are elongated, may easily be used by removing it and cutting it into two pieces, as indicated on the illustration, and redrilling it as shown.—*Thomas Naylor, Roundhouse Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. James, Minn.*

CYLINDER HEAD LIFTER.

A simple device for handling cylinder heads when they are removed or replaced with the aid of a portable crane, or by one suspended from the smoke stack, is shown in

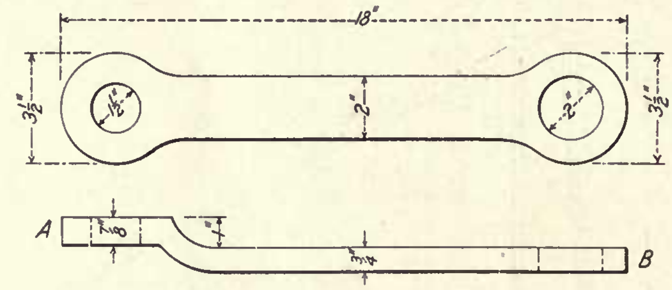



**Fig. 531—Cylinder Head Lifter.**

Fig. 531. It is made of soft steel, the end *A* fitting over the stud at the center of the cylinder head. The other end is formed into a 2-in. eye to fit the crane hook.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

CYLINDER HEAD LIFTER.

Cylinder heads of locomotives equipped with a footboard extending over the steam chest are difficult to

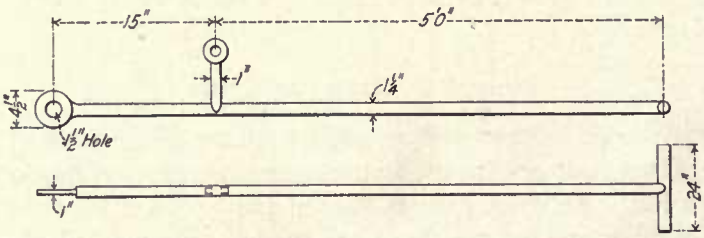



**Fig. 532—Device for Handling Cylinder Heads on Locomotives.**

handle. The jib crane used for removing steam chest lids, cylinder heads, etc., cannot be used unless the foot plate is taken off. To overcome the difficulty the bar shown in Fig. 532 is used. One end of it is put over the cylinder head casing stud, the hanger near the end is hooked into the jib crane chain and a man handles the tee handle on the long end. This device, while exceedingly simple, is a great convenience.—*Charles Maier, Engine House Foreman, West Jersey & Seashore, Atlantic City, N. J.*

DRIVING BOX CELLARS, REMOVING.

A handy tool for removing driving box cellars is shown in Fig. 533. Often a cellar sticks tightly and it is a diffi-

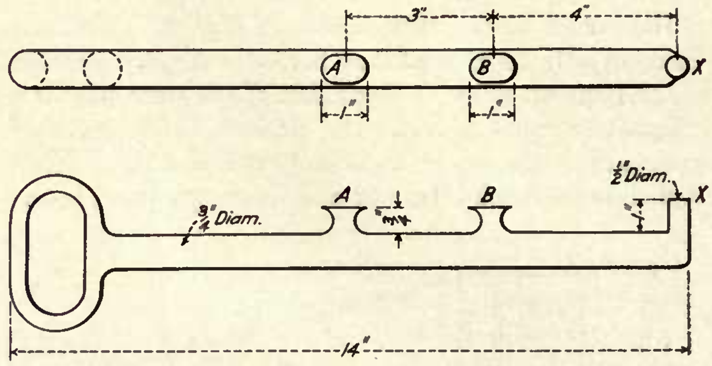



**Fig. 533—Tool for Removing Driving Box Cellars.**

cult job to get it out. By hooking the lug *X* into the cellar bolt hole and using the points *A* and *B* on the tool as fulcrums for a small bar, the cellar can be pulled out quite easily. The tool may also be used to advantage for stirring up or pulling the old packing out of the cellar after it has been removed. It is made of soft steel and the handle can be of any convenient size.—*H. L. Burrhus, Assistant to General Foreman, Erie Railroad, Susquehanna, Pa.*

CYLINDER HEAD TRUCK.

A handy truck for handling front cylinder heads and placing them in position on the cylinder is shown in Fig. 534. The cylinder head is placed on the truck with the

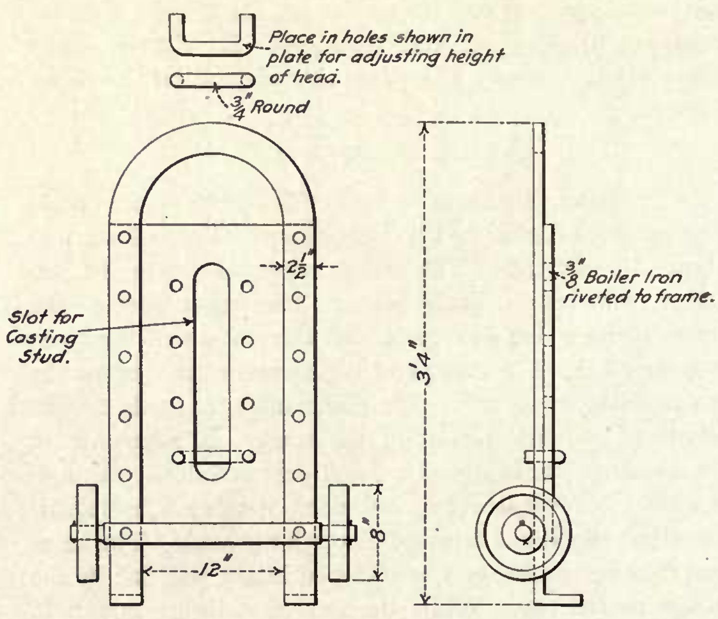



**Fig. 534—Cylinder Head Truck.**

stud for the cylinder head casing projecting through the slot in the ⅜-in. plate. A washer and nut are placed on the stud to hold the head on the truck. The head is then adjusted so that when the truck is raised the studs will enter it correctly. The truck is lifted to the position shown in the drawing. The head may then be raised to the proper height and held there by placing one of the U pieces in the holes underneath it and using a bar in the slot. By moving the truck forward the head can then be slipped over the studs.—*James Stevenson, Foreman, Pennsylvania Railroad, Olean, N. Y.*

### DROP PIT.

At the Omaha, Neb., shops of the Union Pacific is a small roundhouse for storing locomotives while breaking them in and also for making light repairs. This building is being extended so as to be available for making more light repairs to engines which would ordinarily occupy valuable space on the erecting shop tracks. Such repairs usually involve the removal of engine or tender truck wheels and driving wheels, and large drop pit jacks, as shown in Fig. 536, are provided for this purpose. The jacks are to be operated by water pressure from the shop mains at 120 lbs. A new design has been devised for the drop pit and its mechanism (Fig. 535), which includes an improved method of removing the rails and locking them. Ordinarily the rails are removed by hand or by overhead jib cranes, but with the new design the rails with their supporting beams are dropped with the wheels. They are locked in position at regular rail level by a sliding beam operated by a rack and a geared quadrant. The hydraulic piston is 15 in. in diameter, and the cylinder is supported on the pit truck by a cast iron housing in the usual way. The piston is provided at the top with a cast head 3 ft. wide, having brackets for the two 8-in. I-beams

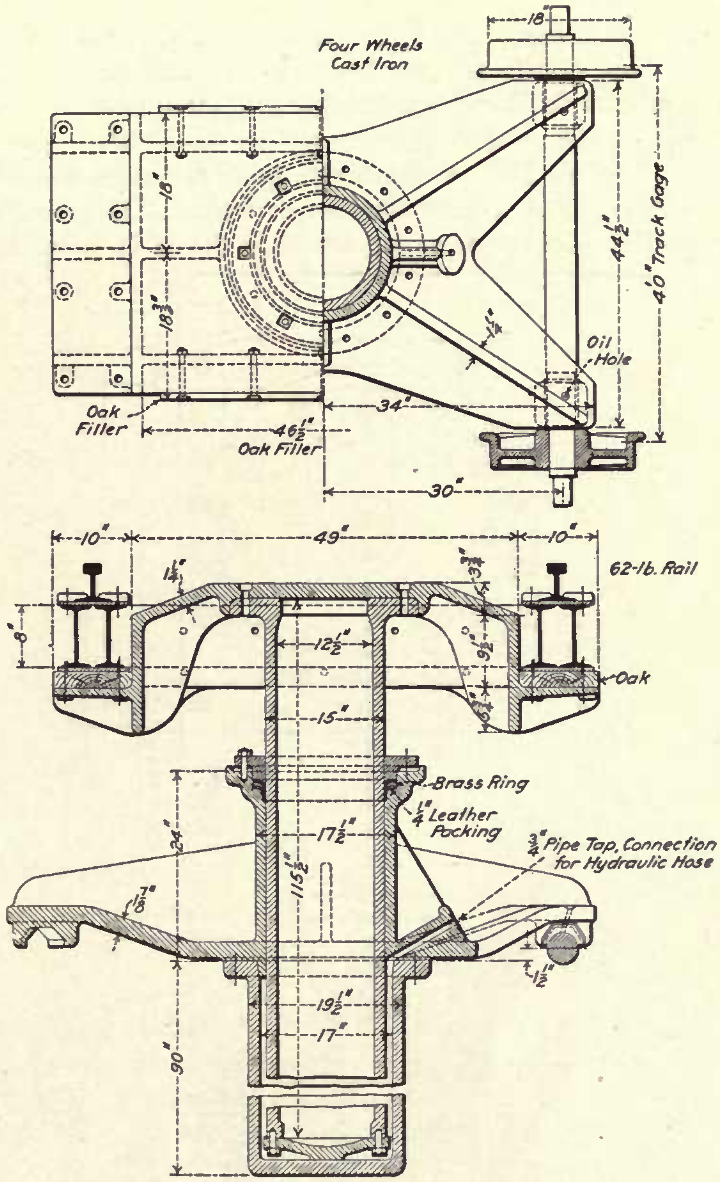



Fig. 536—Drop Pit Jack.

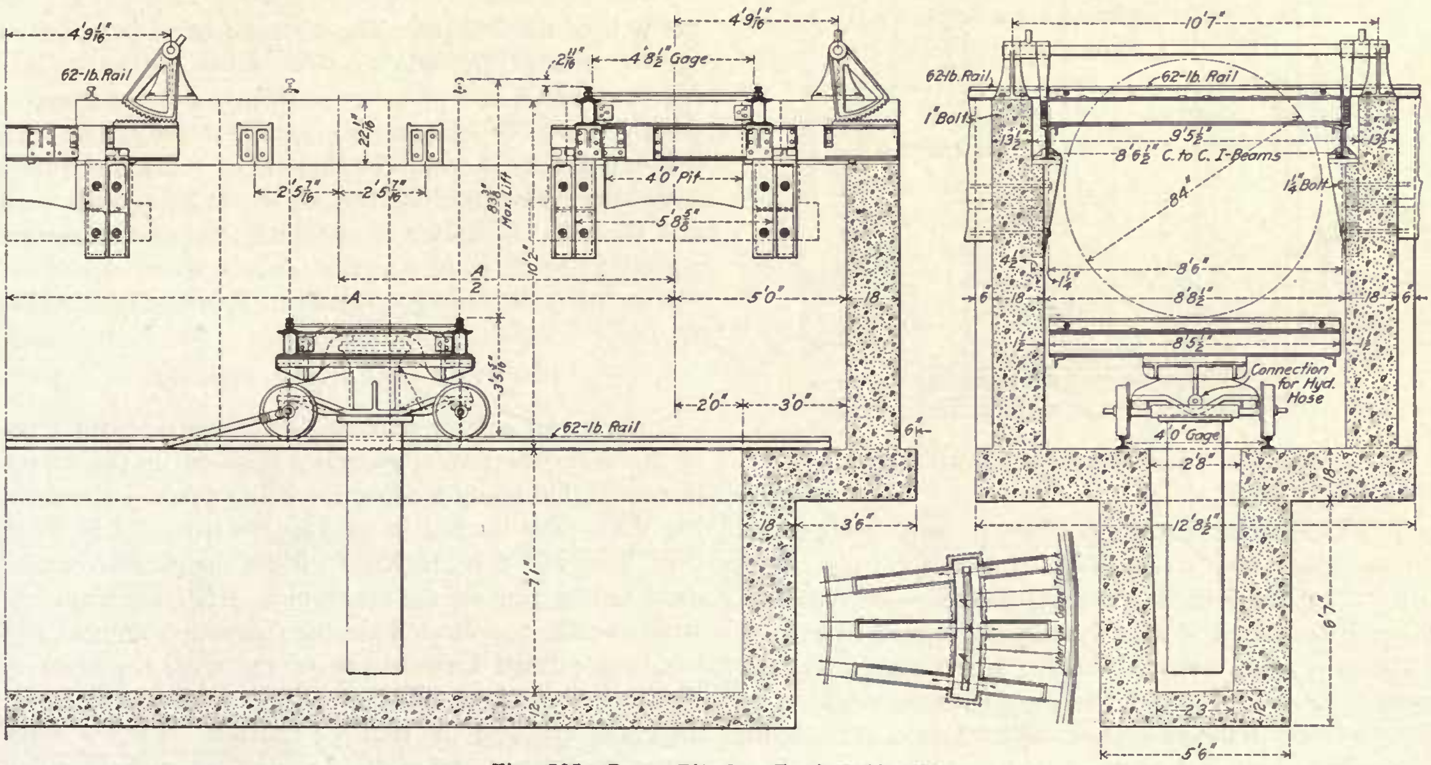



Fig. 535—Drop Pit for Engine House.

under each supporting rail. These beams are bedded on 2-in. oak planks and are bolted to the cast head, and together with the rail are dropped with the wheels.

Along the pit walls near the top are bolted heavy cast iron brackets that are fitted with guides through which move the 12-in. I-beams that support the rail in normal position. On the outer top flange of the 12-in. beam a rack is bolted, and on the top of the pit wall are bearings for the shaft which carries the geared quadrant. The latter is operated by a lever and meshes with the rack. When it is desired to drop wheels, the large I-beams are withdrawn from contact with the wheel beams and the space is clear for the latter to drop with the wheels. In this way loose rails are kept out of the way, and the work of handling them is performed by hydraulic power. The drawings illustrate the design as worked out for large driving wheels.

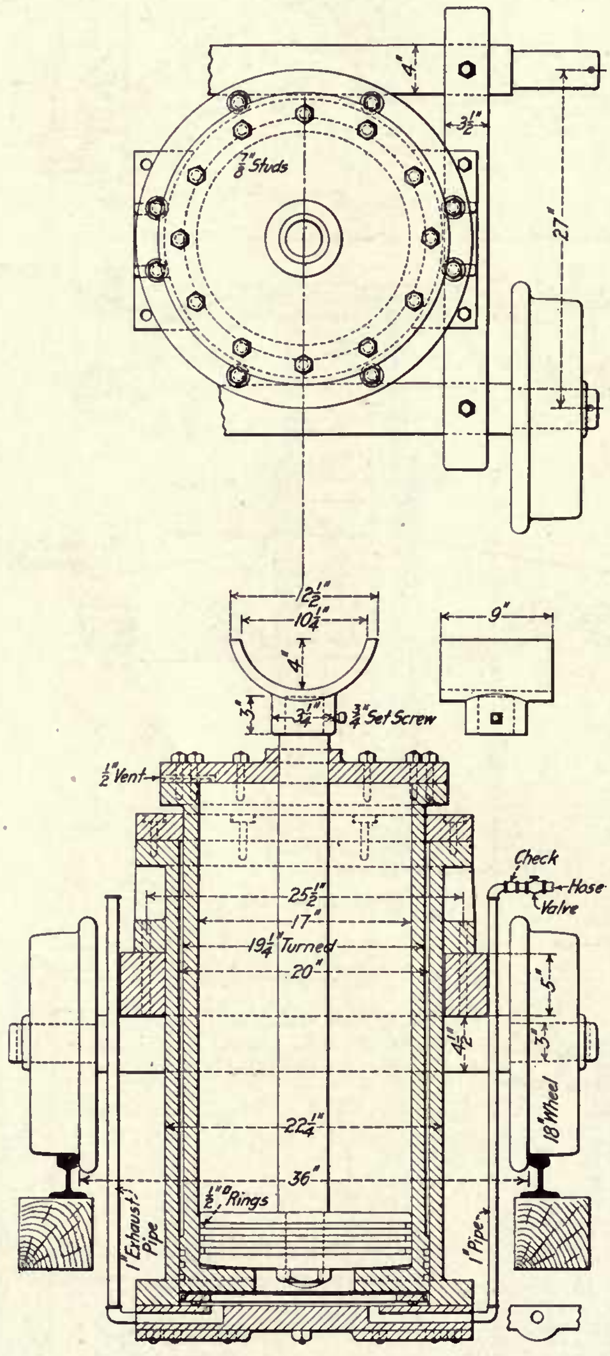



Fig. 537—Telescopic Drop Pit Air Jack.

DROP PIT JACK, TELESCOPIC.

A telescopic air jack in a drop pit in the engine house permits the use of a comparatively shallow pit, which is of considerable advantage in that it is more handy to work about and is also less dangerous. A jack which has been used for this purpose is shown in detail in Fig. 537. The wheels of the truck on which it is supported are 18 in. in diameter, the general arrangement of the truck being clearly shown on the drawing. The piston is 17 in. in diameter. After it has reached the top of the cylinder the inner cylinder starts to rise and the stroke of the piston is thus practically doubled.—*H. L. Burrhus, Assistant to General Foreman, Erie Railroad, Susquehanna, Pa.*

DROP PIT RAIL REMOVER.

A handy and easily made device for moving the heavy I-beams on which the rails are laid alongside of drop pits is shown in Fig. 538. It consists of a piece of 8-in. pipe, about 2 ft. long, capped at each end and fitted with an ordinary piston packed with leather, the rod of which extends out through one head, which is bored and fitted with a gland and stuffing-box. At the end of the piston rod is a bent piece of wrought iron which is riveted to

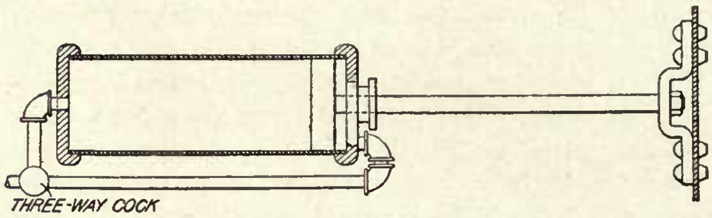



Fig. 538—Drop Pit Rail Remover.

the web of the I-beam. The air connection is made, as shown, with a three-way cock by which air can be admitted to either end of the cylinder and exhausted therefrom. When the rails are in place the piston stands with the rod out, as shown in the drawing. After the wheels have been raised from the rail, air is admitted to the head and the rails are drawn to one side, thus permitting the wheels to be dropped into the pit and removed.—*A. S. Davis, Shop Foreman, Northern Pacific, Jamestown, N. D.*

ECCENTRIC CRANK ARM REMOVER.

A device for quickly removing the eccentric crank arms of the Walschaert valve gear is a necessity in the engine house. A block and wedges for doing this are shown in Fig. 539. The block *B* is of wrought iron, 9¾ in. long, 6 in. wide and 6 in. high, and is cut out to fit over the main rod bearing on the crank pin. After the main rod strap and the rear brass have been removed, and the rod has been pushed forward out of the way, the block is slipped in in its place and fits easily between the inside of the crank arm and the side rod bearing. The key-ways in the block have a taper of ¼ in. in 6 in., and the crank arm is wedged off by driving the two soft steel keys in them. This kink will easily start the most obstinate crank

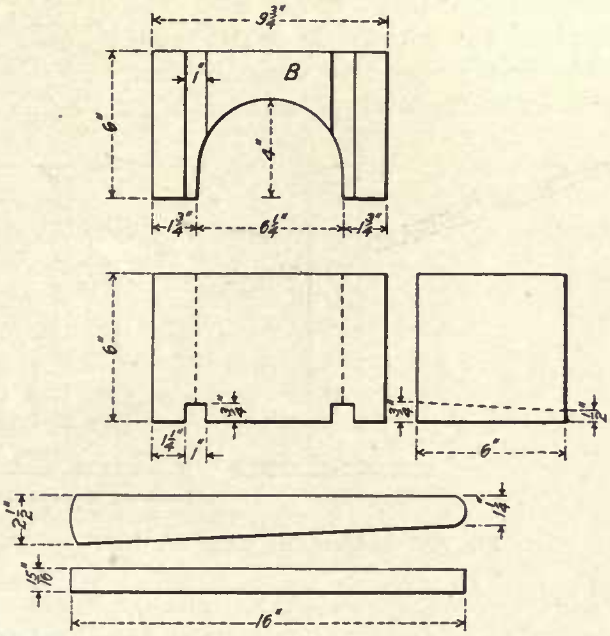



**Fig. 539—Block and Wedges for Removing Eccentric Crank Arm of Walschaert Valve Gear.**

arm without defacing it.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

ENGINES, CONDITION OF.

In large engine houses it is necessary to have some system by which the condition of any engine in the house may be determined at any time. A large board, a partial view of which is shown in Fig. 540, is hung up in a conspicuous place, most convenient to all concerned. It is made of matched lumber, painted black, and is spaced off and lettered with yellow paint. Engineers and hostlers bringing the engine into the house report the engine number, stall number and the repairs required. This information, with the date received and the time called, is placed on the board. When extensive repairs are required, or it is necessary to give the engine a general overhauling, the "cut out for repairs" column is used. The foreman and workmen by consulting this board, and knowing the nature of the repairs and the time the engine is called, can work to better advantage.—*A. G. Pancost, Elkhart, Ind.*

ECCENTRIC CRANK ARM REMOVER.

The device shown in Fig. 541 is as useful on the road as in the shops, for when carried by the wreck crews or kept at telegraph towers it immediately proves its worth when an engine must be disconnected. The shell is laid

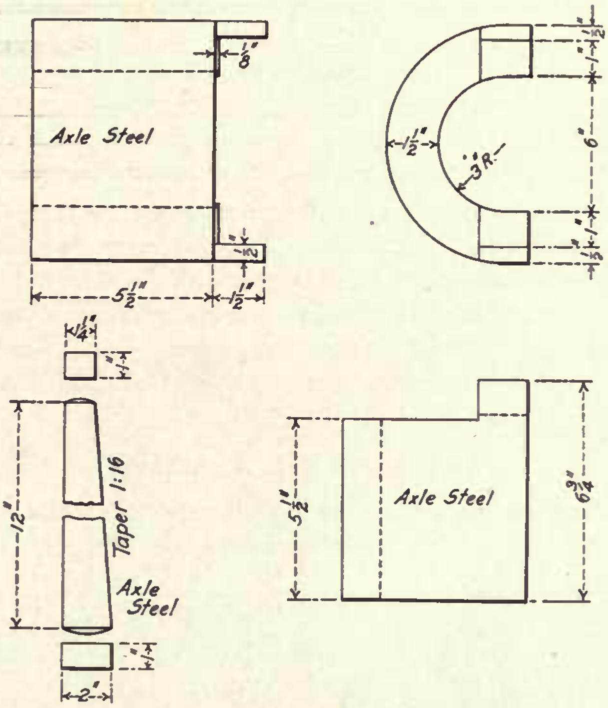



**Fig. 541—Eccentric Crank Arm Remover.**

on the crank pin and the wedge inserted between the eccentric crank arm and the shell. A few blows of the hammer will loosen the tightest fitting crank arm.—*F. S. Robbins, Inspector, Pennsylvania Railroad, Renova, Pa.*

ENGINES IN HOUSE, RECORD OF.

A good arrangement for keeping track of the exact location of an engine after it is placed in the engine house is shown on the accompanying form. It should have the same number of horizontal spaces as there are stalls in the house. When the hostler brings an engine in the house he must write the engine number, the time in and the date on the blackboard on the line opposite the stall number where the engine is placed. The forman can then fill in the time that the engine is to be called, or under the column headed "Remarks," can show any special work that is to be done on it. If all the work is completed

| FREIGHT | | | | | | PASSENGER | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ENGINE NO. | STALL NO. | DATE IN | TIME CALLED | REPAIRS | CUT OUT FOR REPAIRS | ENGINE NO. | STALL NO. | DATE IN | TIME CALLED | REPAIRS | CUT OUT FOR REPAIRS |
| | | | | | | | | | | | |
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**Fig. 540—Partial View of Board Showing the Condition of Engines in the Engine House.**

before the engine is called, he marks it O. K. Any person interested can readily see the condition of every engine in the house by looking over the board. It also enables the workmen to find the engine on which they are to work quickly. If the engine number is not shown on the board, they will know positively that it has not yet been placed

| Stall. No. | Engine. No. | In. | | Out. | | Remarks. |
|---|---|---|---|---|---|---|
| | | Date. | Time. | Date. | Time. | |
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |

in the house, and that it will be useless for them to waste time in looking for it. As soon as the engine has left the house, the foreman or some person with the proper authority can erase the information, indicating that the stall is empty and ready for another locomotive.—*H. L. Burrhus, Assistant to General Foreman, Erie Railroad, Susquehanna, Pa.*

FULCRUM FOR BAR, ADJUSTABLE.

The step bracket in Fig. 542 is especially handy as a fulcrum for putting up shoes, wedges and binders. It is

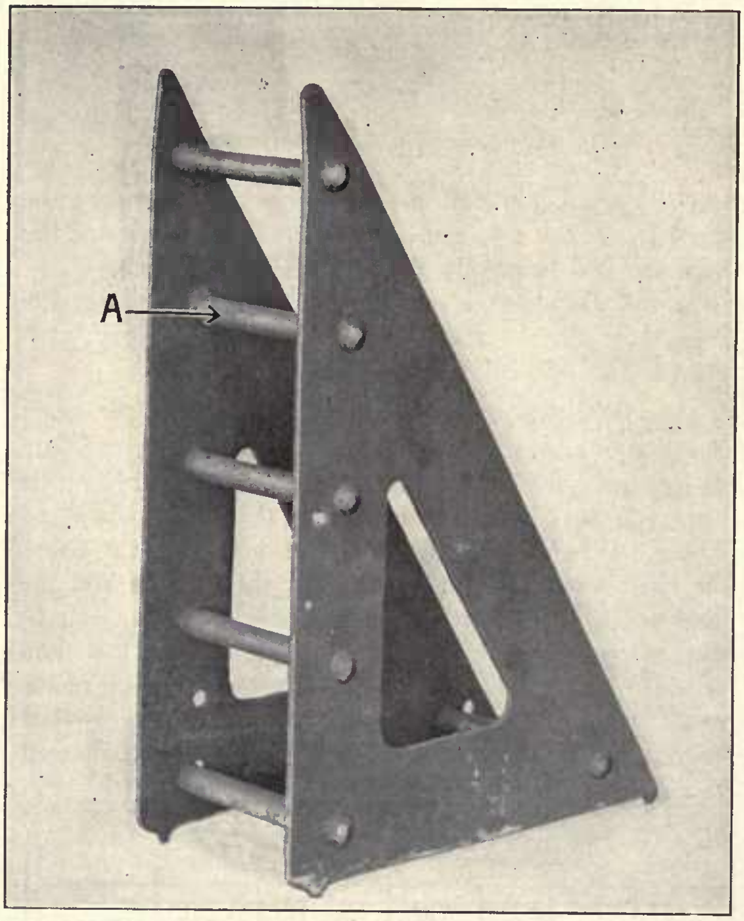



Fig. 542—Step Bracket for Putting up Pedestal Binders.

used with the vertical side placed against the outside of the wheel. A bar is fulcrumed on one of the steps, as *A*, and with one end extending through the wheel and under the part to be raised. A sufficiently wide range is afforded by the five steps or points of support for putting up a binder.—*Chicago & North Western, Chicago.*

FULCRUM FOR BAR, ADJUSTABLE.

An adjustable foot to be used with a bar as indicated in the drawing is shown in Fig. 543. This device is very convenient for roundhouse work, and is used continually by the man who works on brake rigging. It overcomes the necessity of, and loss of time in, hunting

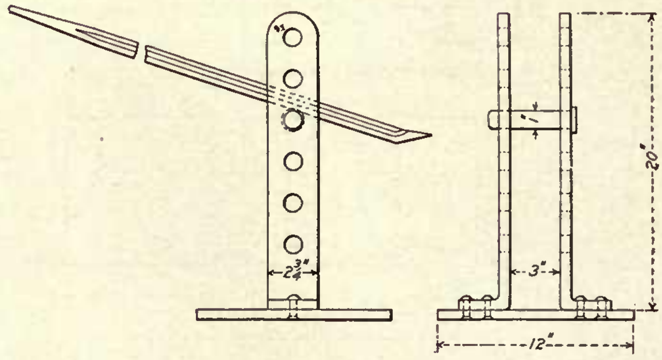



Fig. 543—Adjustable Foot for Bar.

for blocks. Being adjustable for different heights, it is particularly advantageous for a great variety of work, such as putting up shoes and wedges, etc.—*Elmo N. Owen, General Foreman, Southern Pacific, Bakersfield, Cal.*

GASKET CUTTER.

A portable pneumatic machine for cutting gaskets from old hose is shown in Fig. 544. The former practice was to cut such gaskets with a knife, but this took consider-

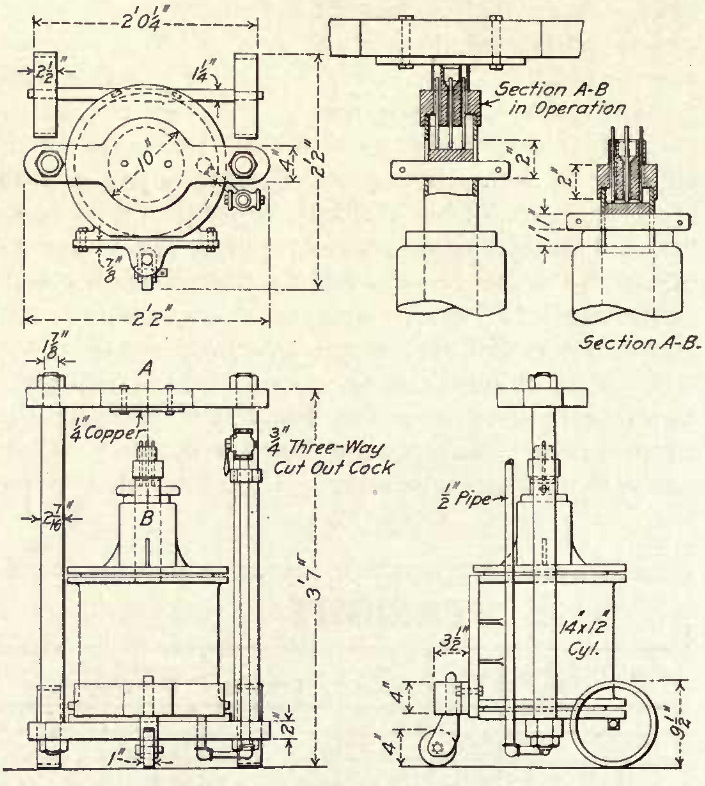



Fig. 544—Portable Pneumatic Gasket Cutter.

able time and the gaskets did not prove satisfactory. With the new device, it is possible to keep a good stock of different sizes on hand by having the machine placed in the tool room so that the man in charge can cut them out during his spare time. The ¼-in. copper plate against which the hose is held prevents the tool steel cutter from being injured. Although a rather large air cylinder is used (12 in. x 14 in.), the stroke is limited by a bar, which passes through the slot in the piston rod, to about 3½ in., so that only a comparatively small amount of air is used. This bar also assists in driving out the gasket after it has been cut, for as the piston rod drops downward three pins which pass through the cutter come in contact with the cross bar and force the gasket and center upward. No trouble is experienced with the breakage of cutters, as is the case when a hammer is used.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

### GASKET CUTTER.

A gasket cutter of special design is shown in Fig. 545. It is turned from tool steel and may be used either by hand, with a special machine, or with an air hammer. The cutting edges are turned to size and carefully hardened. A coil spring operates the steel plug in the center, and also the four ⅛-in. pins in the annular space between the cutting edges, for removing the center piece and the completed gasket. A ring with four set screws, having

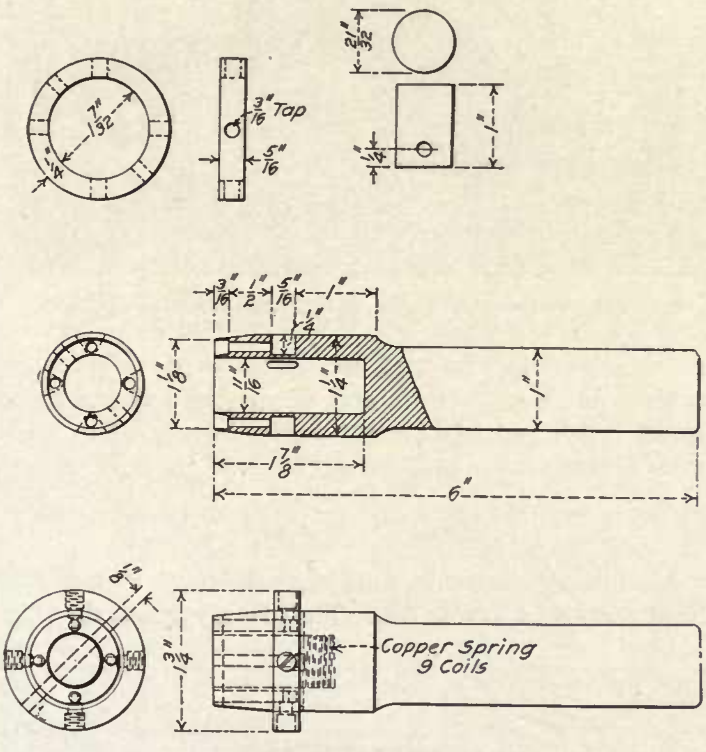



**Fig. 545—Gasket Cutter.**

1/16-in. ends bearing on the ends of the ⅛-in. pins, is fitted to the cutter, as shown. A steel plug 21/32 in. in diameter, is mounted on a ⅛-in. pin extending diagonally through the cutter and the ring. Slots are made in the cutter to allow movement of the plug on the pin. When pressure is applied to the tool and the gasket is cut, the plug is forced back against the coil spring. Upon releasing the pressure, the coil spring forces out the plug, the collar and the pins, which in turn push out the center and gasket. As this is automatic, gaskets can be cut very rapidly.—*S. S. Lightfoot, Bonus Demonstrator, Atchison, Topeka & Santa Fe, San Bernardino, Cal.*

### HOIST, PNEUMATIC.

A pneumatic hoist with a trolley and an overhead track is a most convenient means of handling heavy material about the pits in an engine house. If the trolley tracks are arranged in U shape, the legs of the U extending along each side of a pit, each one of them will serve three pits.

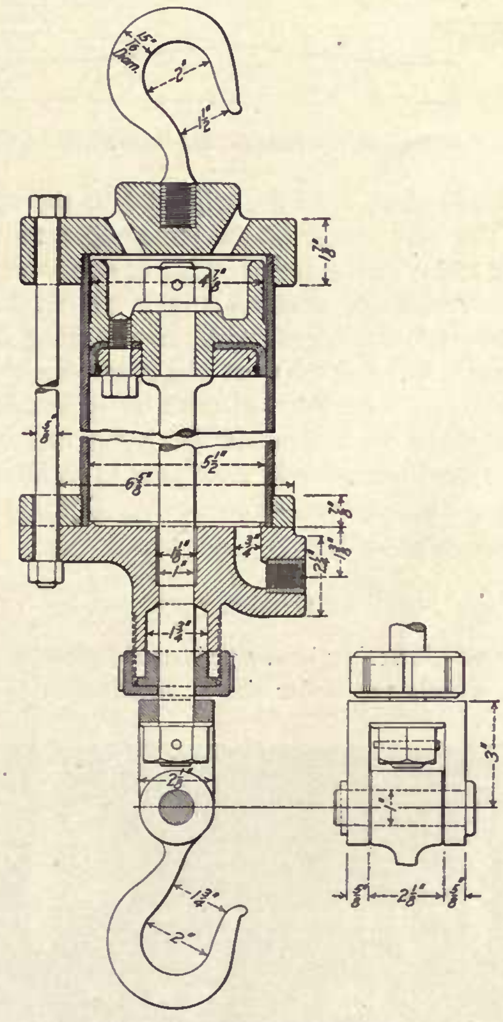


**Fig. 546—Pneumatic Hoist.**

thus requiring a minimum number of hoists. An air hose extending from above the center of the middle pit can be made to follow either leg of the U. The hoist, which is shown in detail in Fig. 546, has a capacity of from 1,200 to 1,500 lbs., and can be made any desired length. The cylindrical portion is made of brass, but heavy iron pipe may be used after it has been properly smoothed inside, or cast iron may be used. In the latter case, the wall should be not less than ½ in. thick. The construction of the hoist is clearly shown on the drawing.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### OLD MAN FOR BOILER WORK.

Probably one of the simplest substitutes for an old man in drilling holes in a boiler shell is the device shown in Fig. 547. It is always a matter of difficulty to place an ordinary old man for drilling holes in the boiler shell. This device consists merely of a metal plate and sufficient chain attached to it to extend around the boiler. After passing the chain around the boiler and allowing for the

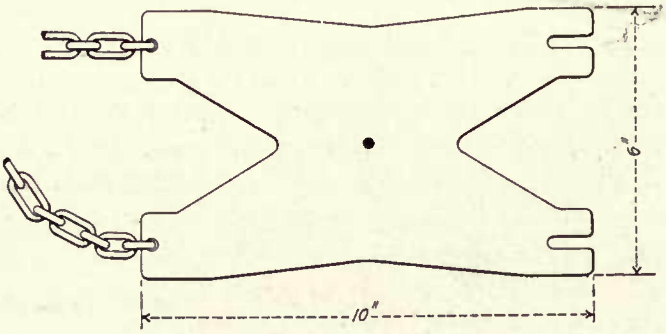
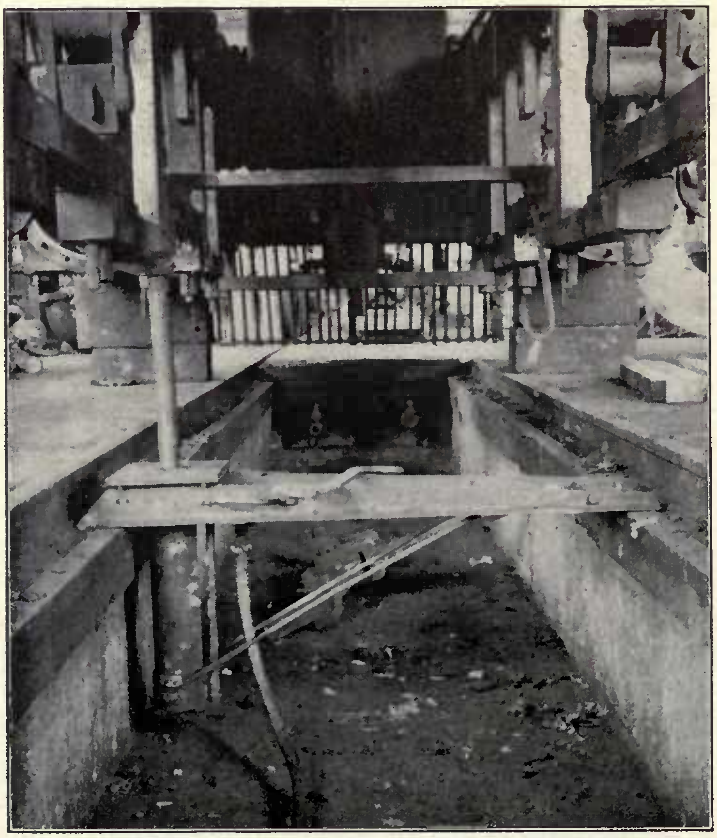



Fig. 547—Flexible Old Man.

air motor and drill, links are slipped into the openings shown. The feed center of the motor operates against the center mark in the plate. This device is especially handy in roundhouse work, saving a large amount of time which is usually consumed in arranging for the ordinary old man. For the want of a better name we have termed this tool a flexible old man, as it so effectively overcomes the many difficulties which are met in using the ordinary old man, due in great part to its limits as to flexibility and adjustment.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

PEDESTAL BINDER, JACK FOR.

Raising and lowering heavy pedestal binders, especially when the wheels are under the locomotive, or when the work is being done in the roundhouse under a hot engine, is a most difficult job. A light, portable jack designed for this work and which is quite efficient is shown in Fig. 548. The cross-pieces are made of light sheet metal, made angular to provide stiffness. The air cylinder is mounted at one end and its piston carries a shoe—made from an ordinary engine step—on which the binder rests. In using, the binder is placed on the shoe, air is applied and the binder is carried up and held in place until the nuts are placed.—*Lehigh Valley, Sayre, Pa.*



Fig, 548—Jack for Handling Heavy Pedestal Binder.

PISTON FOLLOWER BOLTS, CHASING.

A considerable saving of time results from the use of the small pneumatic bench lathe, shown in Fig. 549, for chasing follower bolts. It consists of an air motor *A* mounted on the base plate *B*; also of a special chuck *C* for holding the follower bolt, a tailstock *E* and a tool carriage *F*, which carries the chaser to *G*. This provides a simple and easy means of chasing follower bolts at the bench and is especially useful in connection with roundhouse work.—*Chicago & North Western, Chicago.*

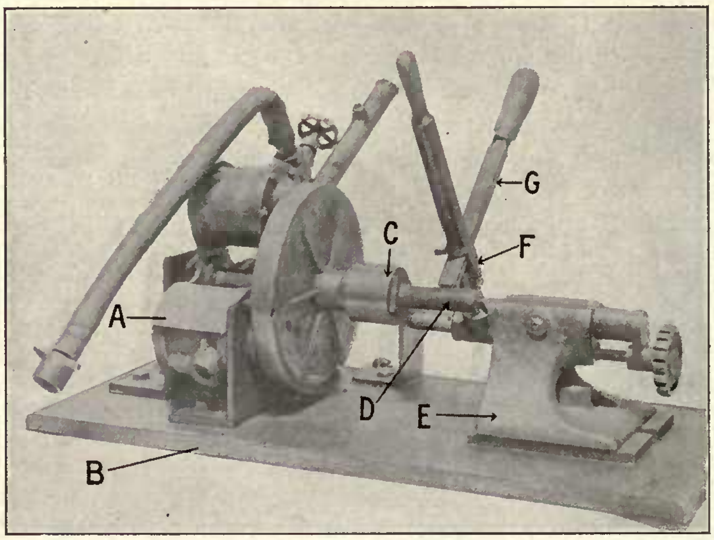



Fig. 549—Pneumatic Lathe for Chasing Follower Bolts.

PISTON RING TOOLS.

Two handy tools for applying snap rings to a piston head are shown in Fig. 550. The tool *A* spreads the ring and *B* is used as a lever for pulling it down into place.—*Chicago & North Western, Chicago.*

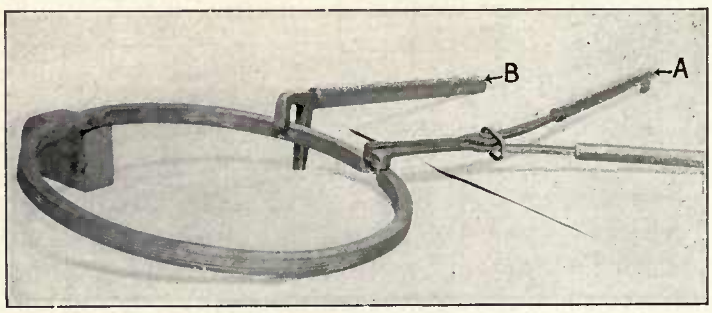



Fig. 550—Tools for Applying Snap Rings to Piston Head.

PISTON ROD PACKING, CHANGING.

A time and labor-saving device for use in connection with the changing of piston rod and valve stem packing is shown in Fig. 551. Unless a special device of this kind is used for holding the gland in place while the nuts are being removed or put on, the machinist doing the work must have a helper to assist him. In that case the helper would hold the gland in place with a bar, but when the nuts are removed and he starts to ease up on the pressure on the gland in order to allow it to back off, the bar is liable to slip and allow the gland to be thrown back against the crosshead, often knocking off the copper ring that forms the joint. It then becomes necessary to draw the piston rod from the crosshead to put in a new joint. With the use of the device illustrated one man can change the packing, and there is no possibility of the copper ring being injured or of the machinist bruising his hand, due to the slipping of the gland.

The ram or pusher *B* is 1 in. in diameter, the end *A*

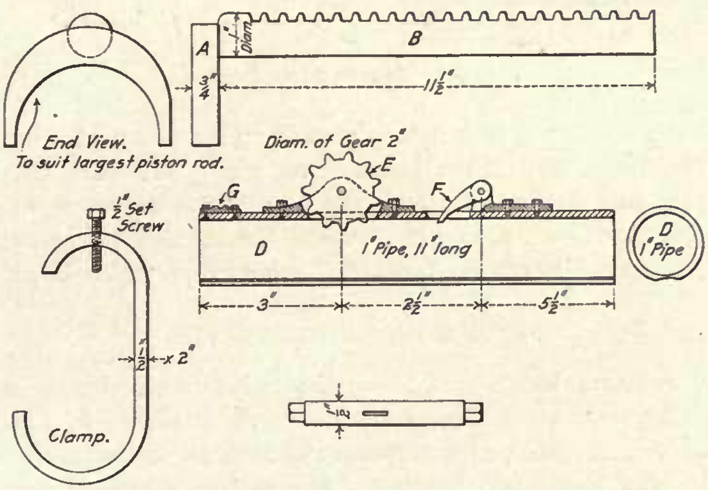



**Fig. 551—Device to Facilitate the Changing of Piston Rod Packing.**

butting against the gland. *D* is made of a piece of 1-in. pipe and forms a sleeve for *B* to work in. To remove a gland, the pipe *D* is clamped to the rod. As may be seen from the illustration, the bottom of the pipe is trimmed for its full length so as to fit snugly on the rod. *D* is adjusted so that the pusher *B* is extended as far outward as it will go and still mesh with the teeth on gear *E*. The clutch *F* is then dropped down, engaging the teeth in *B*. The nuts on the gland are removed, after which a wrench is placed on the end of the ½-in. shaft to which *E* is keyed, the clutch *F* is thrown backward, and the gland is backed off slowly. New packing is put on the rod, after which the gland is forced back into position and held by the clutch *F* while the nuts are being replaced.—*F. Nowell, Locomotive Foreman, Canadian Pacific, Ottawa, Ont., Can.*

PISTON VALVE PORT OPENINGS, DEVICE TO FACILITATE TAKING.

Many machinists know what trouble is experienced in taking the port openings on a piston valve locomotive when steam is up. The device shown in Fig. 552, which can be made for 75 cents, greatly assists in this work. An indicator plug is removed and the small end of the

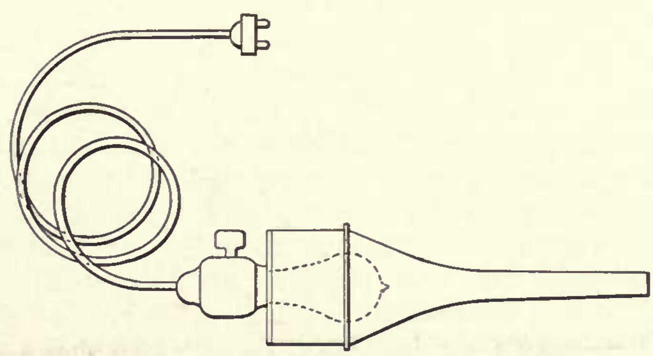


**Fig. 552—Device to Facilitate Taking Piston Valve Port Openings.**

device inserted. It is provided with an electric light and the opening can be plainly seen, regardless of the steam. No guesswork is necessary, as is the case when using pieces of tin or wire to catch the opening.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.*

SAND BOXES, REPAIRING.

The problem of repairing sand boxes in the engine house is complicated by the need of having some means

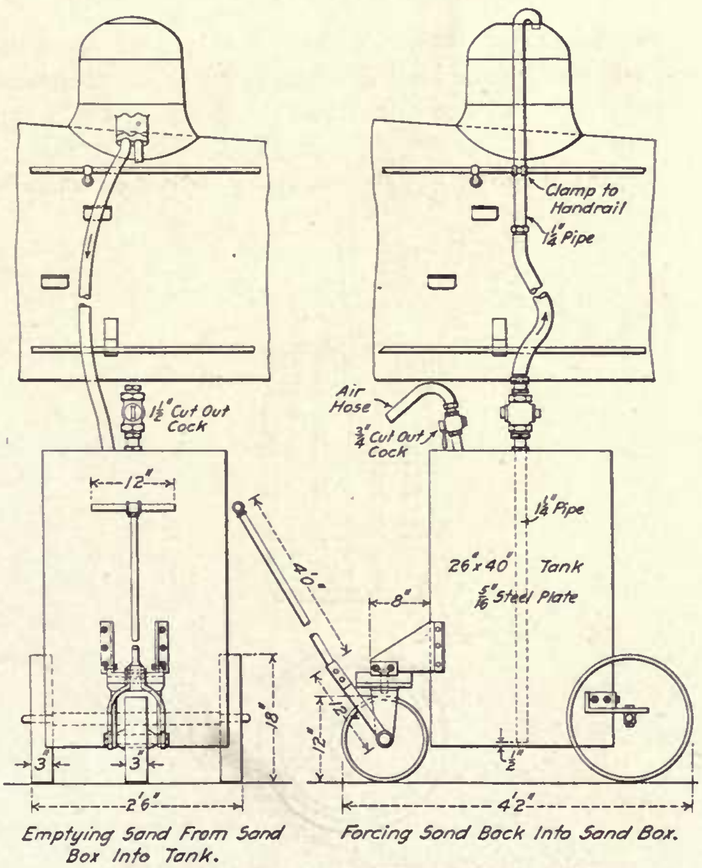



**Fig. 553—Handy Device Used in Connection With the Repairing of Sand Boxes.**

of emptying the sand from the box and replacing it after the repairs have been made. The usual practice, when it is known in advance that repairs must be made to the sand box, is not to take sand before going into the house. Such sand as remains in the box at the end of the trip is run out on the engine house floor or in the pit and is carted to the sandhouse or the refuse dump by a laborer. It is then necessary for the engine to take sand on its way from the house, which is not always a convenient operation, particularly if special provision has not been made for sanding on the outgoing track and the operating department is in a hurry to get the engine. To overcome this the portable tank shown in Fig. 553 has been constructed. It is wheeled alongside the engine, the sand pipe is disconnected, and the sand is run into the tank through the rubber hose, connected as shown in the left-hand view in the illustration. When repairs have been completed, the portable tank is connected to the sand box, as shown in the right-hand view, and air is admitted to the tank by connecting the air hose to the air line and opening the ¾-in. cut-out cock. The 1½-in. cut-out cock is opened and the air pressure forces the sand back into the sand box. This method makes it possible to fill defective sand boxes before they come into the house and thus prevents any delay on leaving the house. The portable sand tank is 26 in. x 40 in. in size and is constructed of 5/16-in. steel.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

SAND BOX REPAIRS.

The apparatus shown in Fig. 554 is used for temporarily holding the sand when repairing locomotive sand boxes. Two holes are drilled near the top of the barrel and an iron rod is run through them. Another hole is bored in the bottom, as shown, and a sheet iron valve is

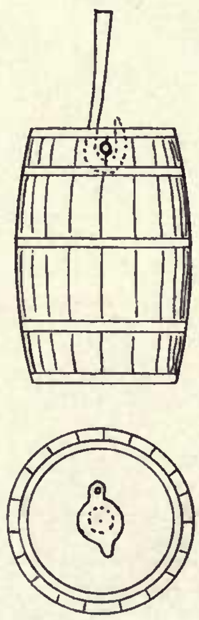


Fig. 554—Temporary Receptacle for Sand.

provided for closing it. When it is necessary to draw the sand from the box it is run into the barrel and the necessary repairs are made. The barrel is then lifted up over the sand box and the sand is allowed to run into the box by opening the valve at the bottom.—*James Stevenson, Foreman, Pennsylvania Railroad, Olean, N. Y.*

SAND DRYER.

A steam sand dryer, which is simple and does the work of two stoves, is shown in Fig. 555. The hopper is about 58 in. x 97 in. and has a nest of steam pipes in the bottom. These pipes are placed close together and will not allow the sand to pass through while wet or damp,

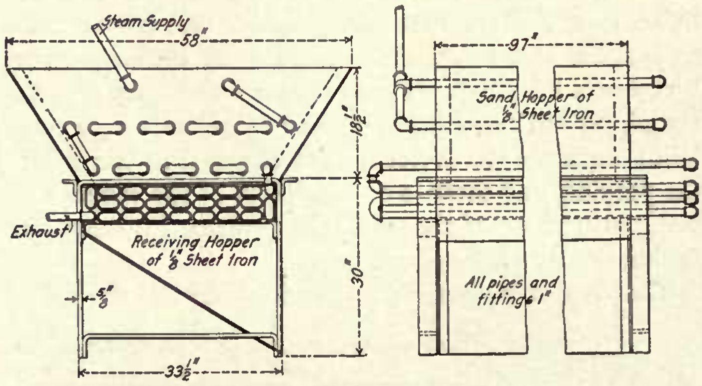



Fig. 555—Steam Sand Dryer.

but when dry it falls through readily without any shaking or sifting. All of the joints of the piping are made outside, and, in case of a leak, the sand in the hopper is not moistened.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, New Mex.*

SAW FOR LOCOMOTIVE FRAMES.

A convenient device for sawing a locomotive frame in order to insert a piece for a new weld is shown in Fig. 556. It consists of a portable rail saw, as manufactured by the Vandyck Churchill Company, so arranged that it may be operated by an air motor connected to shaft *A*,

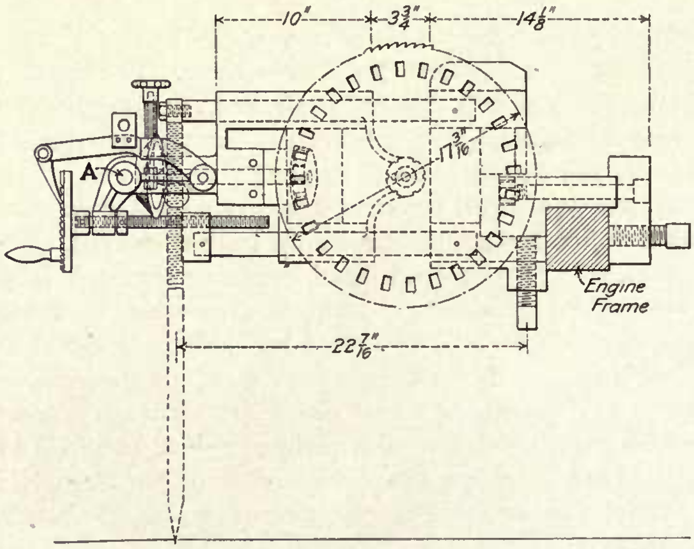



Fig. 556—Locomotive Frame Cold Saw.

and fed by hand or automatically by the pawl and feed mechanism shown in the illustration. Two adjustable legs support one end of the machine while the other end is clamped to the locomotive frame.—*R. G. Bennett,* *Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

SAW, PORTABLE HACK.

The portable air motor-driven hack saw, shown in Fig. 557, is used principally for cutting out sections of broken frames which it is desired to weld without removing from the engine. The angle iron is clamped to the engine frame and the rear end of the saw frame is supported on

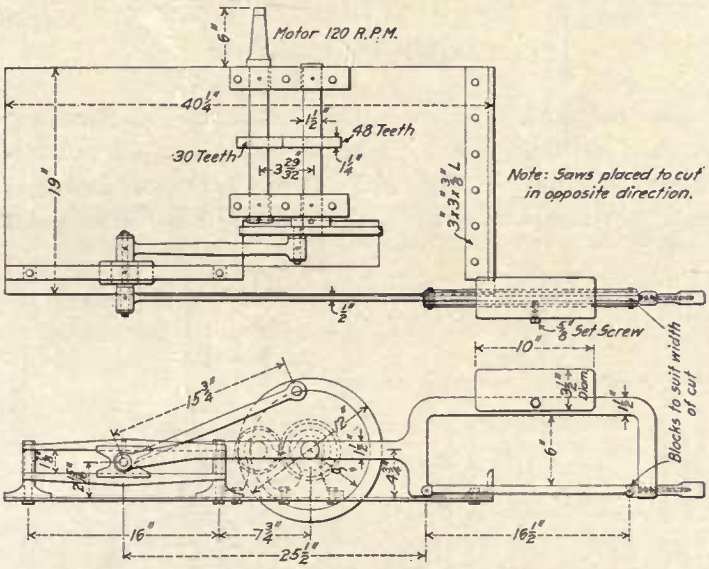



**Fig. 557—Portable Hack Saw Driven by an Air Motor.**

blocking. The two saw blades are placed to cut in opposite directions and are spaced apart by blocking, to suit the thickness of the piece which it is desired to remove.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

SPRING COMPRESSOR.

An apparatus for compressing the spring so that the driving or truck spring hangers can be put in position is

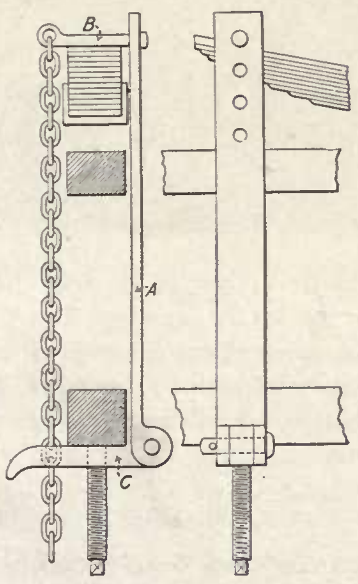



**Fig. 558—Spring Compressor.**

shown in Fig. 558. It consists of a flat bar *A* with a series of holes drilled at one end and a hinge hook *C* at the other. It is placed against the inside of the frame and a key *B* inserted in one of the upper holes. The chain is drawn down and looped into the hook (the drawing does not show this quite as clearly as it should). By operating the screw at the bottom the spring can then be compressed the desired amount.—*A. Lowe, Canadian Pacific Railway, Glen Yard, Westmount, Montreal.*

SPRINGS, DEVICE FOR REMOVING AND APPLYING.

The lever and the clamp, shown in Fig. 559 afford a most convenient means for removing and applying driving springs in the engine house. With the driving wheels in place, the springs are usually quite inaccessible and ordinarily four or five men are required to move a spring by the obstructions, and in so doing they often crush their fingers. The clamp of the new device, by which the spring is lifted, consists of two hooks which engage the ends of the spring. These are connected by a turnbuckle, so that adjustment can readily be made for different lengths of springs. By means of the I-bolt attached to one side of the turnbuckle, connection is made

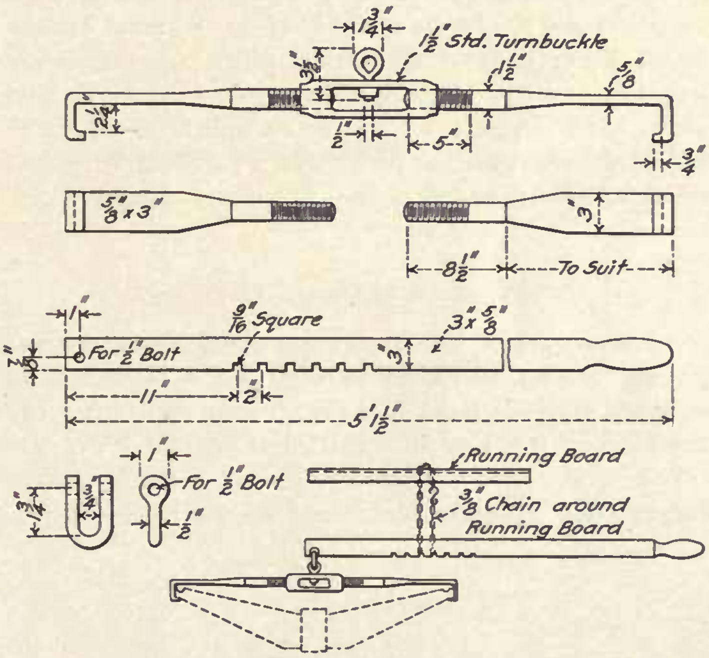



**Fig. 559—Lever and Clamp for Removing or Applying Driving Springs.**

to the clevis on the end of the iron lever. This lever is suspended from the running board by means of a ⅜-in. chain, which engages one of the six notches in the lever to prevent its slipping. In removing a spring, two men press down on the handle of the lever and lift the spring; then by pushing it sideways it may be lowered on to one of the side rods, from which point it is handled in the usual manner. It takes half as many men and half the time to do the work in this way as compared to the old method; it is also much safer.—*C. J. Lindgren, Roundhouse Foreman, Chicago, Burlington & Quincy, Aurora, Ill.*

SPRING PULLER.

There is probably more temper lost, especially in the roundhouse when the locomotive is fired up and due out, in connection with spring pulling than with any other job on the locomotive. Various spring pullers have been devised, using chains or plates or a combination of both, but the block here shown, Fig. 560. is probably one of the most effective ones which can be devised. This block

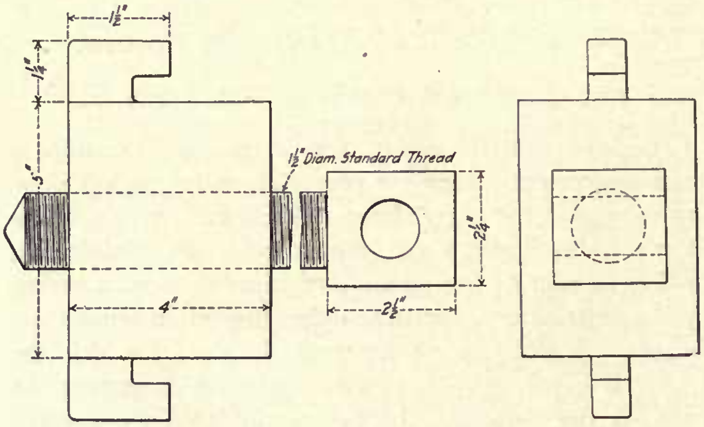



**Fig. 560—Spring Puller.**

is used with two plates which extend up to the top of the spring. A bolt is placed across the spring and through the plates and the hooks of the block are inserted in slots in the lower ends of the plates, which are sufficiently long to permit the screw working against the under side of the lower frame rail. The tool's lightness, simplicity and effectiveness are the points which particularly recommend it.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

TENDER TRUCK BEARINGS, CHANGING.

An arrangement for sponging journal boxes and removing brasses is shown in Fig. 561. The track is equipped with air jacks in a pit and the necessary tools and blocking are kept in a tool chest near by. Two air cylinders are used for removing tender truck brasses and two for removing trailer and engine truck brasses.

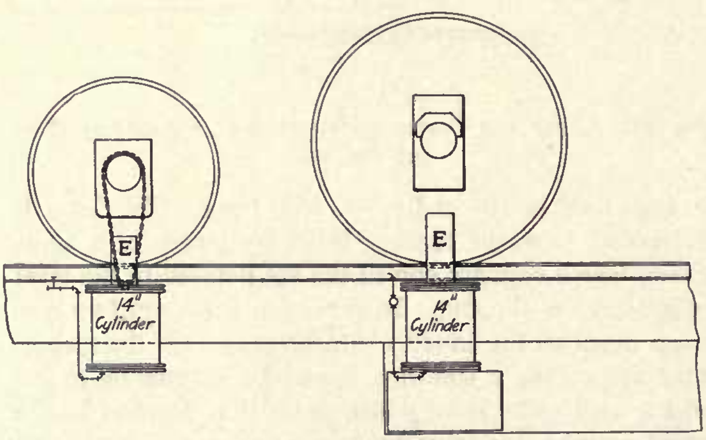



**Fig. 561—Pits and Jacks for Removing Journal Bearings.**

These cylinders are 14 in. in diameter and have a 12-in. lift, using air pressure from 100 to 135 lbs. per sq. in. Two chains are provided with each pair of cylinders, which go under an iron bar, that passes under both rails, and over the axle, holding the wheel to the rail while the journal box is raised to remove the bearing. Two water valves are located on each side of the pit to which hose is attached for cooling off hot journals. The cylinders are piped together, but are so arranged that they may be used independently if desired; the piping may be connected either to the shop air line or to the train line hose back of the tank. The plungers of the cylinders are provided with removable pieces *E*, which fit between the tops of the cylinders and the under sides of the journal boxes.—*Charles Maier, Engine House Foreman, West Jersey & Seashore, Atlantic City, N. J.*

SPRING PULLER.

A tool which is very useful for rapidly removing broken or defective locomotive springs in the roundhouse is shown in Fig. 562. Being light, the device is easily handled and quickly adjusted. The hardened point

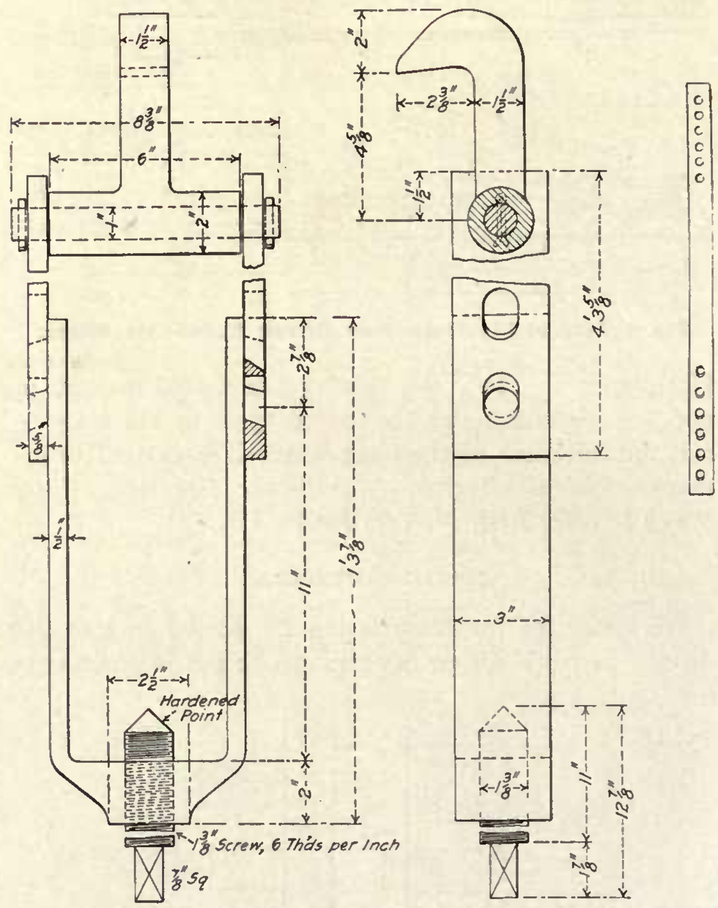



**Fig. 562—Spring Puller.**

bears against the lower rail of the frame, and the hook grips over the top of the spring. The two side bars are fitted with a series of pin holes at each end in order that the length may be varied to suit conditions.—*A. D. Porter, Shop Efficiency Foreman, Canadian Pacific, West Toronto, Canada.*

TENDER TRUCK BEARINGS, REMOVING.

In removing tender truck brasses two hydraulic jacks are generally used and the wheel is often raised, preventing the brass from being removed. In the latter case it is necessary to use a pry on top of the wheel, which requires extra help to remove a defective brass. By the device here shown, Fig. 563, one man can readily remove a brass in four or five minutes. A small screw or hydraulic jack is placed about 4 ft. from the wheel and

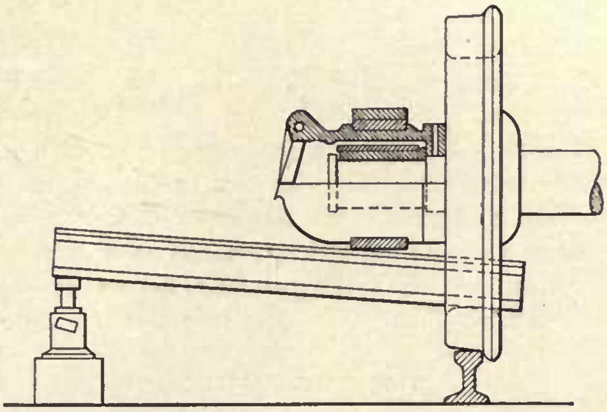


Fig. 563—Device for Removing Tender Truck Brasses.

a piece of rail is used as a lever.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, N. Mex.*

TENDER TRUCK BEARINGS, REMOVING.

A special kink, which is useful in removing tender truck brasses, is shown in the photograph, Fig. 564. It not only saves the time which is required in looking for blocking on which to place the jack, but also holds the wheel to the rail, as the lip on its end fits over the tread of the wheel. Occasionally the wheel will tip up if a

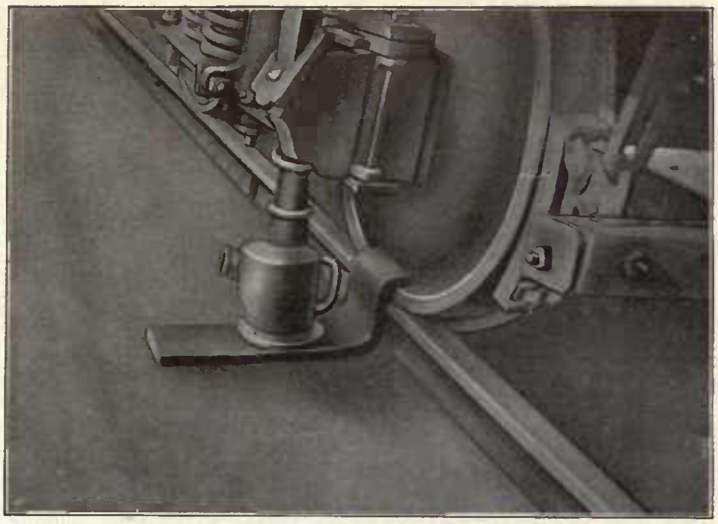


Fig. 564—Jacking Up Journal Box Preparatory to Removing Brass.

device of this kind is not used, due to the weight on the other end of the axle. The tool has been used successfully on soft ground where ordinary blocking would sink in. It can be made of any size iron, but for good results it is best to use a piece of 1-in. x 5-in., about 14 in. long.—*H. L. Burrhus, Assistant to General Foreman, Erie Railroad, Susquehanna, Pa.*

TIRE HEATER.

The tire heater shown in Fig. 565 uses gasolene. It is a simple contrivance, consisting of a reservoir about 9 in. in diameter and 24 in. long, with a pipe and funnel at the top for filling and one leading off from the bottom to the burner, which is shown at the right. Air is admitted to the top of the reservoir, thereby putting a pressure on the gasolene; at the same time it comes down to the burner through the pipe on the outside. The mixture of air and gasolene is drawn out through the

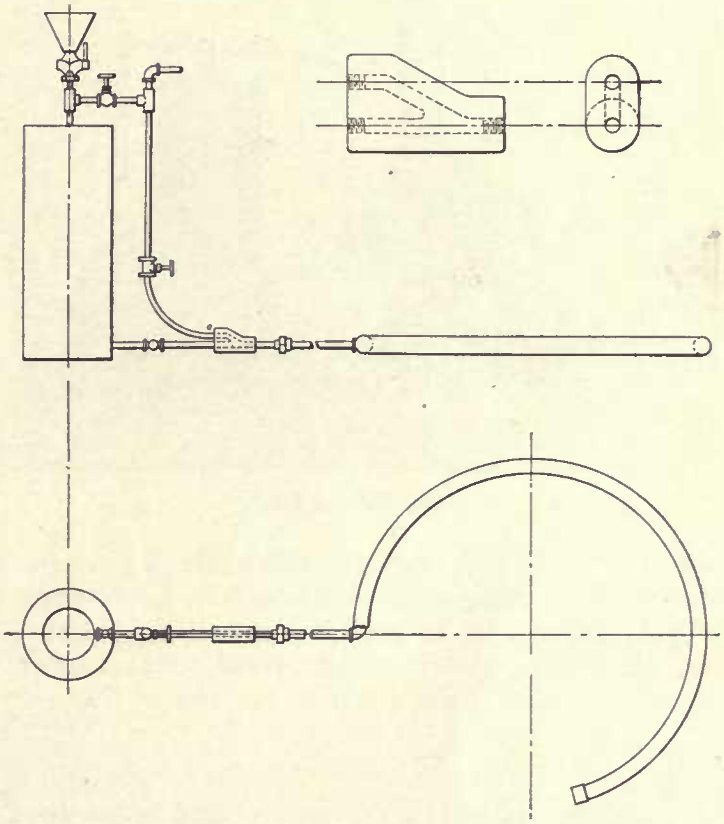


Fig. 565—Tire Heater.

Y connection into the circular burner that surrounds the tire and is there ignited, heating the tire in the ordinary way.—*A. Lowe, Canadian Pacific Railway, Glen Yard, Westmount, Montreal.*

TIRE HEATER.

A portable oil tank and heater for use in connection with a tire heating ring is shown in Fig. 566. It is a simple and economical device for removing or applying driving or truck wheel tires in an engine house. The oil tank *A* is an old 12-in. x 33-in. auxiliary reservoir. A ⅜-in, feed pipe extends from the tee just above the top head down into the tank and to within one inch of the bottom. One end of the tee is connected to the ¾-in. supply pipe *C*, provided with a check valve, which goes to the heater *B*. The other end of the tee is connected to the air supply, which may be throttled down to give the desired mixture for proper combustion. At the side of the tank is an air pipe connected to the air system through a reducing valve set to 20 lbs. This gives the pressure necessary to drive the oil from the tank *A* through the heater *B* to the ring. The heater *B*, made from an old 12-in. air brake cylinder with 9 ft. of ¾-in. pipe coiled inside of it, heats the oil, forming a gas. This pipe comes out of the heater at *D* and is connected to the pipe extending to the heating ring by a coupler at *E*. The heater is heated by wood, charcoal or by a burner fed from the oil pipe. The tire heating ring is made of 1-in. pipe, with openings ½ in. long and

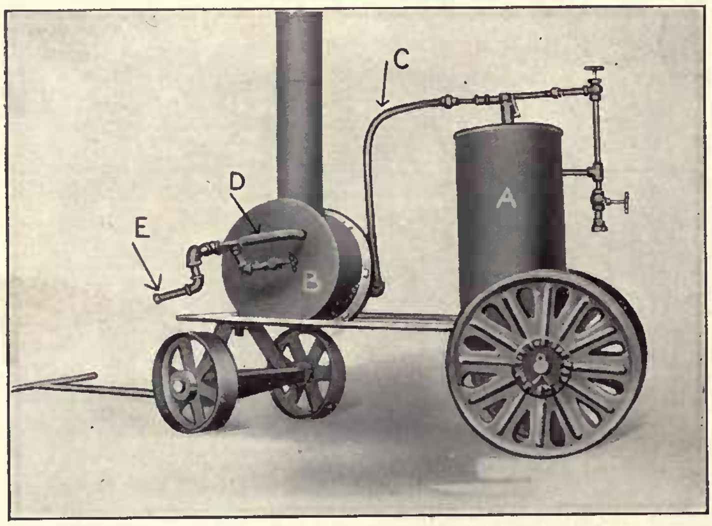



**Fig. 566—Tire Heater.**

the width of the hack saw blade, which gives a good wide flame. This arrangement comes in very handy where driving tires are to be tightened at outlying points.—*W. H. Fetner, Master Mechanic, and C. L. Dickert, General Foreman, Central of Georgia, Macon, Ga.*

TIRE HEATER.

The method of heating tires at the Long Island shops is illustrated in the photograph, Fig. 567. Wheels are handled to the stationary stand by the shop crane. This stand is made from an old axle, into which a cross frame

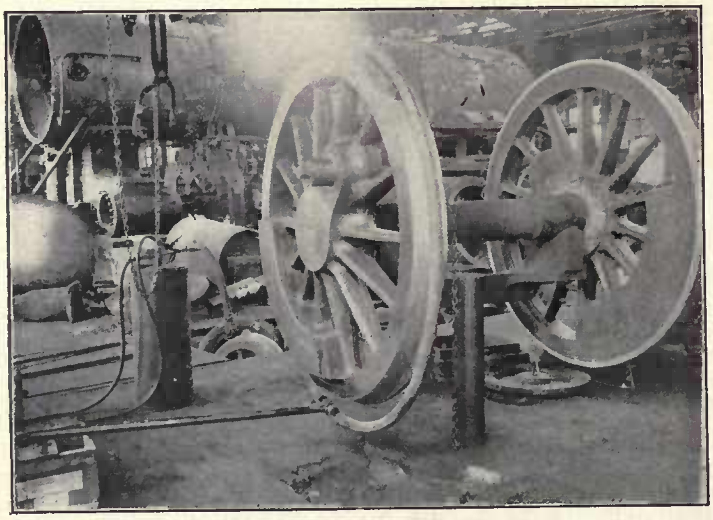


**Fig 567—Driving Wheels and Burner in Position for Heating the Tires.**

brace is secured. The pipe which encircles the tire is perforated with ¼-inch holes. The cheapest grade of fuel oil is used with this heater. The oil is contained in the old air reservoir, and is forced to the jet by air pressure in the tank. The oil reaches the jet through a small pipe which is concentric with the one shown, the outer pipe carrying the air for mixture with the oil at the nozzle. The oil is forced in both directions through the circular pipe and, by proper regulation and after the pipe has become heated, makes a steady blue flame all around the circumference of the tire. There is an open space of about 2 in. on each side of the T-end of the delivery pipe. This allows for syphoning outside air into the circular pipe. The tires are handled by the jaw clamps with a block and fall from a wall crane. It requires from 15 to 25 minutes to remove or replace a tire by this method of heating.—*Long Island Railroad, Morris Park, N. Y.*

TIRE WEAR GAGE.

The tire wear gage, shown in Fig. 568, is a simple and effective tool. The sliding blade, which fits in the slot and may be locked in place by the small bolt, is located one inch from the throat of the flange. The gage is placed in position over the flange, and the sliding blade

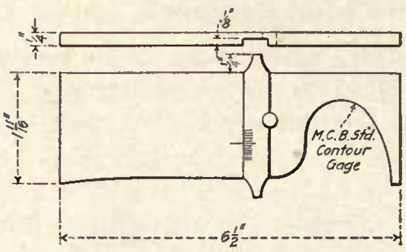



**Fig. 568—Tire Wear Gage.**

is pressed down to the contact with the tire, the wear being indicated on the scale. The straight side of the gage is used for measuring the wear of plain tires in a similar manner.—*L. M. Granger, Assistant General Foreman, and John Todd, Machinist Foreman, Erie Railroad, Galion, O.*

TIRES, SETTING.

In setting tires in the engine house, a pair of iron wedges, 5 in. wide, 2½ in. high and 28 in. long, are placed on the track and the engine is moved over them by means of a shop locomotive. The spring saddles are then blocked from the frame by the use of old rod keys, after which the engine is moved off of the wedges. The wheels and axle, which now carry only their own weight, are jacked up. The brake shoes are removed, and a gas burner, which is made of 1-in. pipe in two sections, is slipped over the tire and heat is applied. By this method one tire can be set in one hour, whereas by the old method of jacking up the engine and taking down the rods it required three hours.—*C. J. Lindgren, Roundhouse Foreman, Chicago, Burlington & Quincy, Aurora, Ill.*

TOOL BOX, PORTABLE.

Each mechanic in the engine house has a standard portable tool box, as shown in Fig. 569. It is somewhat higher than similar boxes used on other roads, measuring 32⅛ in. from the floor to the top of the box. The box

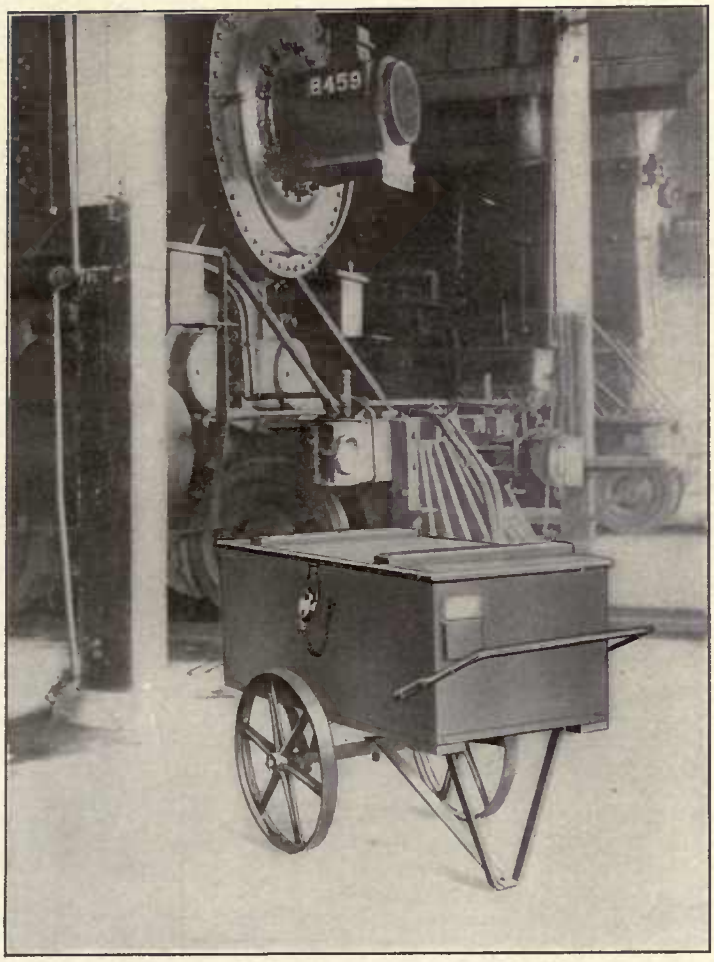



Fig. 569—Portable Tool Box.

measures 42 in. x 18 in. x 14 in. inside and is made of ⅞-in. material. The wheels are 19 in. in diameter so that the box may easily be moved about the house. The tin holder at the back is for work slips.—*C. P. Wilkinson, Apprentice Instructor, Michigan Central, Jackson, Mich.*

TOOL BOX, PORTABLE STEEL.

Portable tool boxes for the machinists are made of steel. This construction, while more expensive than wood, is practically indestructible, and the boxes cannot be broken open. One-sixteenth-inch steel is used and the boxes are 39 in. x 18 in. x 10½ in.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

TUBE AUGER.

A simple tube auger is shown in Fig. 570. The handle is made of ⅝-in. round iron, to which is welded the flat

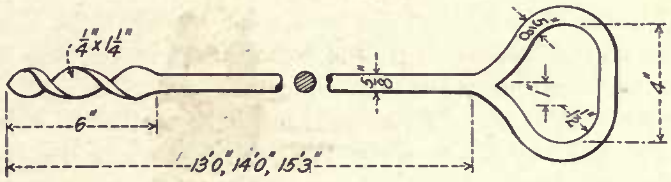



Fig. 570—Tube Auger.

twisted ¼-in. x 1¼-in. soft steel stock. This auger may be made in any length, the three lengths used in our engine house being shown on the drawing.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

WHEEL PRESS, PORTABLE.

A portable combined pneumatic and hydraulic wheel press with a capacity up to 190 tons is shown in Fig. 571.

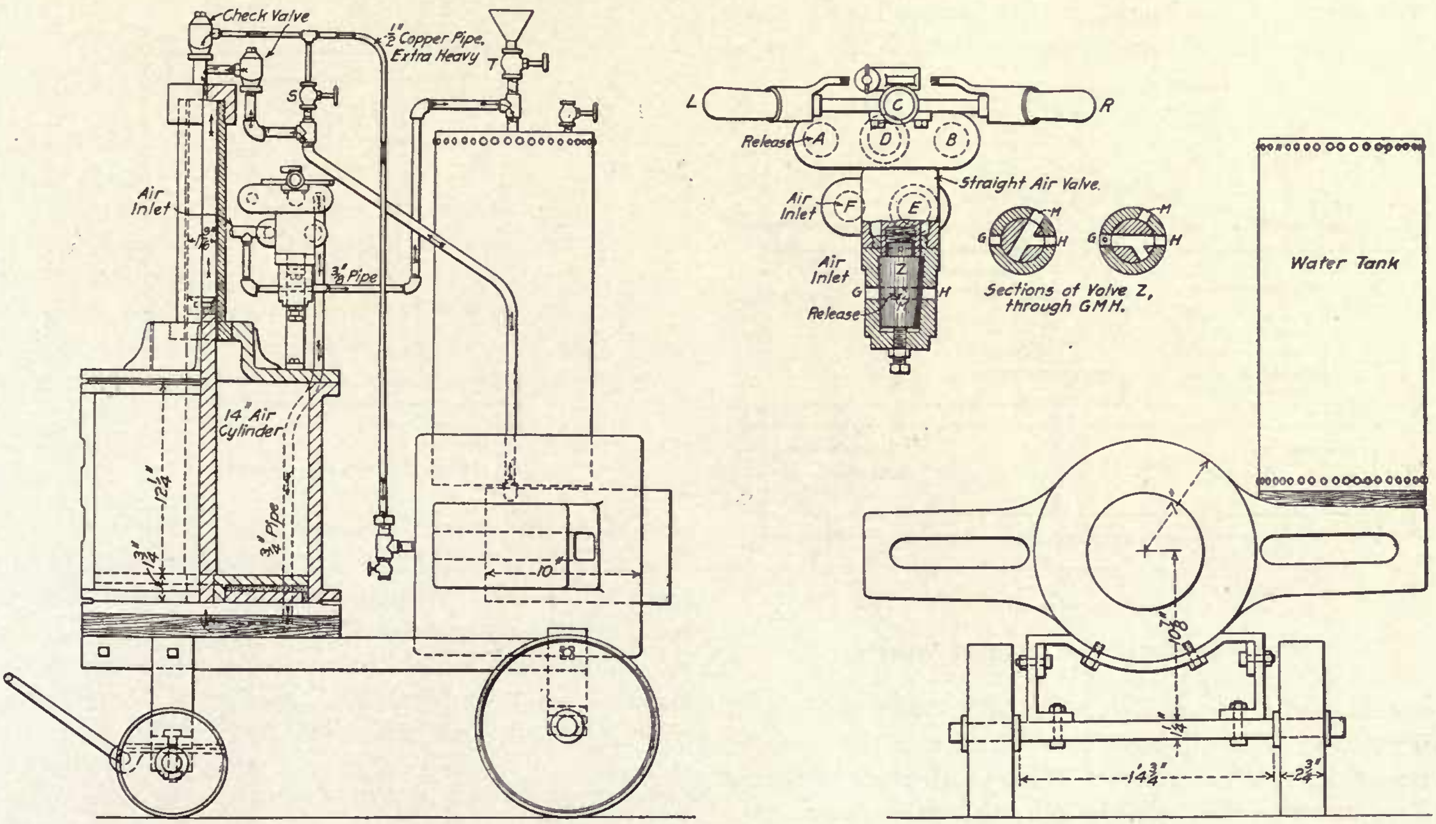



Fig. 571—Portable Wheel Press.

It is mounted on a 4-wheel truck so that it can be used in the roundhouse or in any part of the shop. The ordinary work of pressing a wheel on the axle is accomplished with this machine in three minutes. The 14-in. piston in the air cylinder operates a 1 9/16 in. hydraulic plunger, which forces water into the ram in the press. The air cylinder is operated by a valve, shown in section, and the operation of the various parts is as follows: When the handle is in the center, air is cut off. The handle in position *R* opens valve *E* and closes valve *D*, making connection to the 14-in. air cylinder through *F E B*, as shown by arrows, also closing air inlet in valve *Z* at *G* and making connection through *H* and *M* to the atmosphere, as shown on section of valve *Z* at *G M H*, raising the 14-in. air piston and the 1 9/16-in. water piston, forcing water into the ram. The handle in position *L* closes valve *E* and opens valve *D*, making connection *B D A* from the 14-in. air cylinder to the atmosphere; also opening the air connection on valve *Z* through *G H*, as shown on the section of valve *Z*, to the top of the water tank, forcing water through the pipe at the bottom of the tank to the top of the 1 9/16-in. piston, forcing the piston down and filling the hydraulic cylinder with water ready for another stroke. Each stroke moves the ram ¾ in. To force the ram back, put the handle in the center and open globe valves *S T*. —*John Horne, Draftsman, Chicago, Burlington & Quincy, St. Joseph, Mo.*

WHEELS, TRUCK FOR MOUNTED.

An important advantage of the wagon for mounted wheels, which is shown in Fig. 572, is the fact that it will turn in its own length, and can thus be used successfully in getting around sharp corners in a crowded

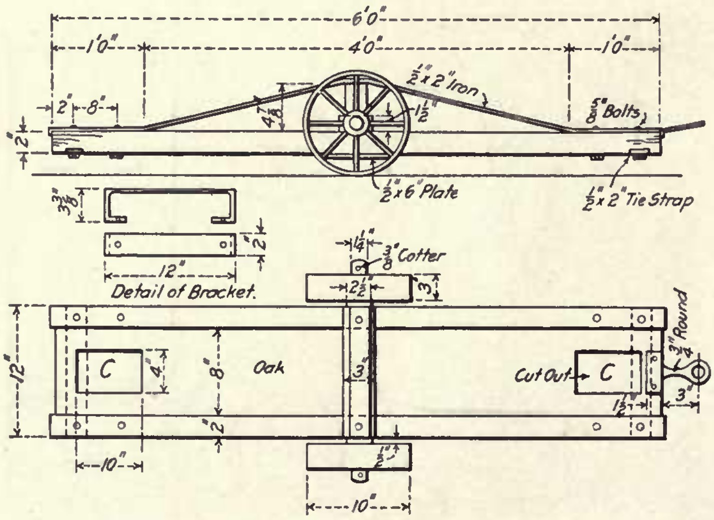



Fig. 572—Wagon for Mounted Wheels.

roundhouse. It is made of a 2-in. x 12-in. oak plank, 6 ft. long, which is hung at its center on the wrought iron axle. The wheels are 10 in. in diameter and have 3-in. threads. The oak plank is stiffened and strengthened by the two trusses of ½-in. x 2-in. iron, which lip over the plank at its ends and are securely bolted to it by the ⅝-in. bolts. A bracket of ½-in. x 2-in. iron, over which the truss straps extend, is bolted over the axle. A ½-in. x 2-in. strap is also placed across the plank on the under side at each end. The top of the wagon is only a few inches above the floor, and the wheels can readily be rolled on it by using a set of iron, or iron faced wooden wedges, which may easily be carried on the wagon. These are usually made 6 in. wide and 18 in. long, and of the proper height to suit the wagon. As the wheels are rolled on the wagon they drop into the recessed parts *C*, which prevent them from rolling off. The wagon may easily be moved about by placing a rope through the eye-strap at the end.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

WORK BENCH.

A vise stand for engine house use is shown in Fig. 573. It is made of cast iron and of a suitable size for placing it between or at the ends of the pits and is much more

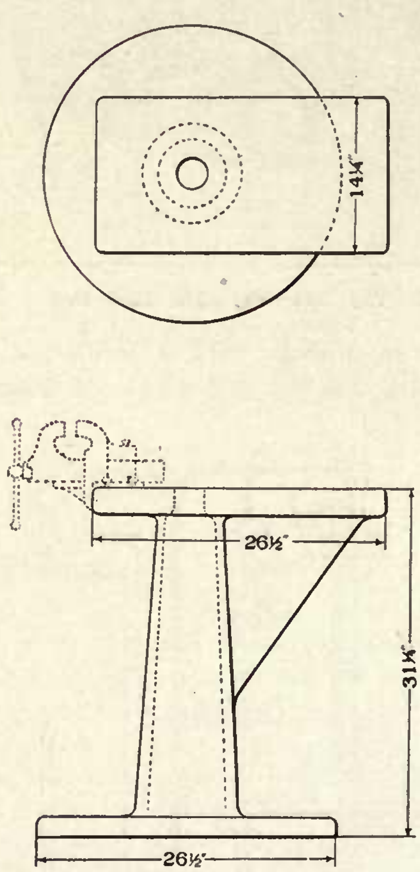



Fig. 573—Vise Stand.

convenient than a wooden bench placed against the wall. It occupies very little space, and at the same time is very rigid and more substantial than any form of wooden bench. The top may be used for straightening bolts, rods, etc., and the design of the base provides no place for scrap material to accumulate.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

WORK BENCH.

A small bench for a vise is shown in Fig. 574. One of these is attached to the posts between every other pit.

The top is 24 by 32 in. in size and is made of 3-in. oak, resting on 1¾-in. angle irons and braced by 2 x ½-in.

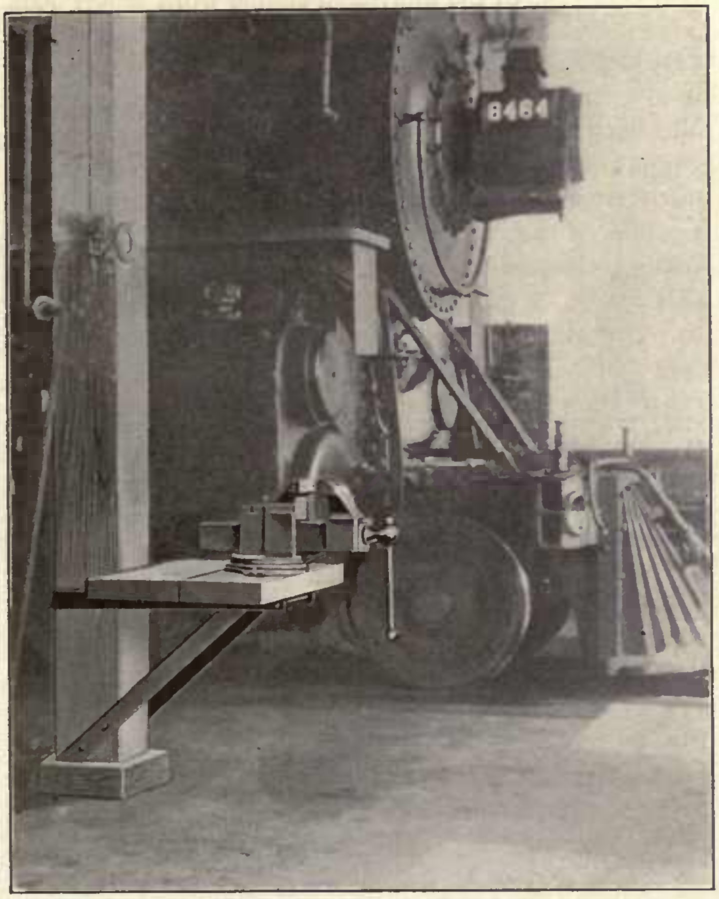



Fig. 574—Vise Bench.

iron, as shown. The bench takes up very little room, is rigid, and is conveniently placed.—*C. P. Wilkinson, Apprentice Instructor, Michigan Central, Jackson, Mich.*

WORK BENCH, PORTABLE.

A portable work bench is a necessity in a roundhouse. Two or three benches of this kind, such as shown in Fig. 575, will take care of this class of work nicely in a 20 to 25-stall roundhouse. The bench is made of oak, well braced and bolted together, and is fitted with a large swivel vise, as shown. The handles at one end are so attached that when they are not in use they drop down alongside the legs out of the way. A special casting at the vise end of the frame carries the axle for the wheels. The weight of the vise at one end so balances the bench

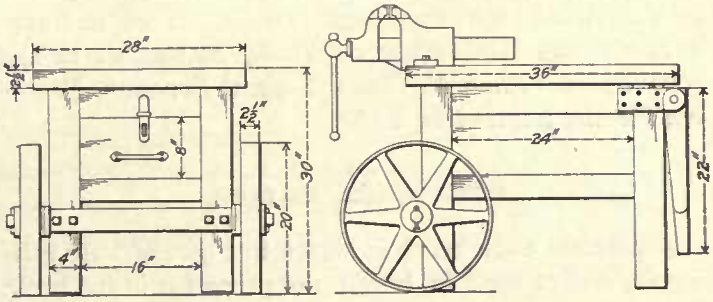



Fig. 575—Portable Work Bench.

that one man can easily wheel it about the house.—*A. G. Pancost, Elkhart, Ind.*

WORK BENCH, PORTABLE.

Much time is saved by the portable work bench shown in Fig. 576, as the workman can move it near the engine and does not have to carry material back and forth, as is necessary where a wall bench is used. The wheels are of large diameter and the bench can readily be moved from one engine to another. It is 28 in. x 36 in. at the top and stands 30 in. high. The construction is substantial, and the drawer is large enough to hold the necessary tools.—*William G. Reyer, General Foreman, Nashville, Chattanooga & St. Louis, Nashville, Tenn.*

WORK BENCH, PORTABLE.

A portable bench, designed for use in the roundhouse is shown in Fig. 577. The top is covered with a sheet of

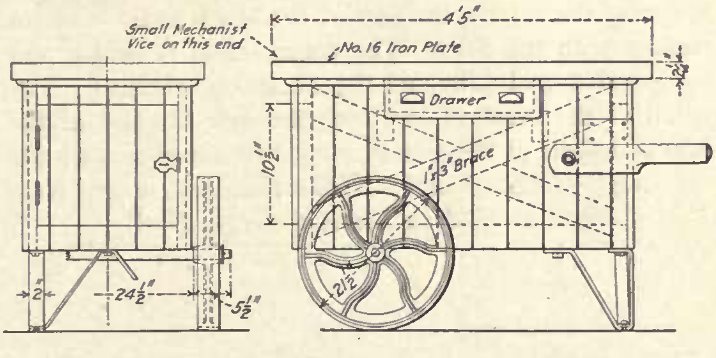



Fig. 577—Portable Roundhouse Work Bench.

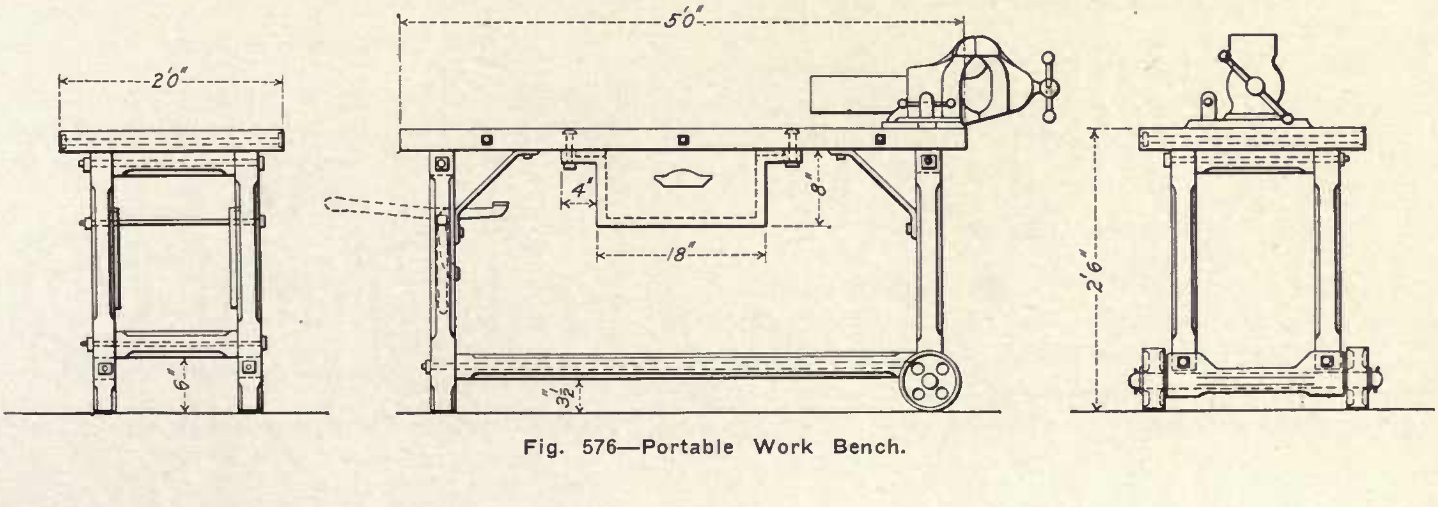



Fig. 576—Portable Work Bench.

No. 16 iron and a vise is secured to the end as indicated. The 20-in. x 20-in. x 5-in. drawer is sufficiently large to carry all small tools required, while larger ones are placed on the inside of the bench itself. This bench will be found a handy and time-saving device by machinists in the roundhouse.—*Elmo N. Owen, General Foreman, Southern Pacific, Bakersfield, Cal.*

### WORK BENCH, PORTABLE.

A portable work bench is shown in Fig. 578. By raising the end of the 1-in. handle and placing it in the hook, the wheels are lowered to the floor, and one pair of bench

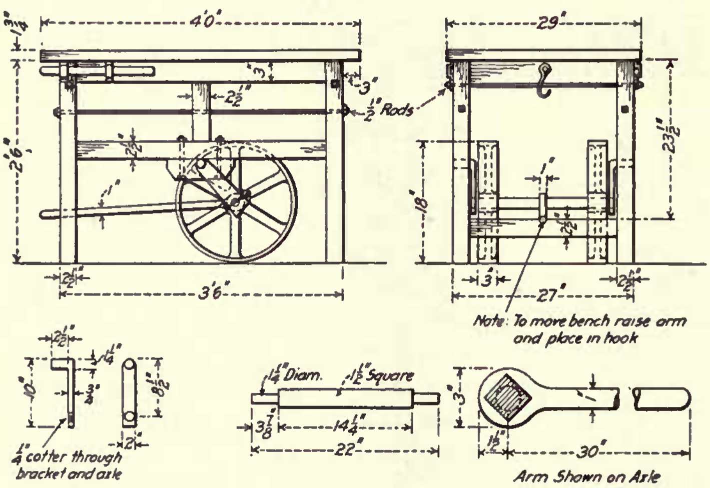



Fig. 578—Portable Work Bench.

legs is raised upward. The bench can then easily be rolled to the most advantageous position for handling the work for which it is to be used. By unhooking and lowering the handle, the legs of the bench again come in contact with the floor. The construction is simple and inexpensive and provides the necessary rigidity. The detail of the brackets in which the axle fits and of the arm or handle at the center of the axle are shown on the drawing.—*H. S. Rauch, Apprentice Instructor, New York Central & Hudson River, Oswego, N. Y.*

### WORK REPORTS.

An important feature of a good engine house organization is the use of the individual engine work report book. This should be kept in a small box or holder in the engine cab, provided exclusively for the purpose, and should be used only by the engineer who is running the engine. The book should have duplicate or carbon sheets, and the engineer should fill out his work report as soon as he discovers anything wrong. Quite often the train must be stopped on the road, giving the engineer a good opportunity to inspect the engine. He may notice some repair that should be made, but too often trusts to his memory to report it on his arrival at the terminal, and sometimes forgets it. If he immediately makes a note of it in the report book there will be no trouble of this kind. Again, if the engine is due at the terminal after dark, and the engineer has an opportunity to inspect it on the road by daylight late in the afternoon and to make out his report at that time, he will make a much closer inspection and his report will be more accurate.

Another advantage is that where engines are not assigned to regular engineers, any engineer that is called to take an engine out can look over the report book and see just what the troubles on the previous trips have been and thus be forewarned. By always having the work report book on the engine, any information concerning its performance can be obtained quickly, thus saving the time of checking over a great number of work reports. When an engine arrives at the engine house, the work report should be taken from the cab by the leading inspector or the foreman of the ash pit, and be given to the roundhouse foreman, thus enabling him to get a check on the kind and amount of repairs that will be required, and also assisting him in assigning the engine to the pit in the house where this work can be most advantageously done. This one point alone is quite important and eliminates a great deal of unnecessary transferring of engines after they have been placed in the house.—*H. L. Burrhus, Assistant to General Foreman, Erie Railroad, Susquehanna, Pa.*

# Car Department Kinks, General

AXLE TRUCK.

A car wheel axle truck, which, with the exception of the wheel and chains, is made entirely of 1½-in. iron pipe and fittings is shown in Fig. 579. By raising the handle and opening the rear hook by means of the rawhide cord the axle may be gripped at one end by the hook and then by lowering the handle the axle may be gripped at the other end in a similar manner. The truck is operated by one man and will handle any size car axle. It is easily made at a cost not to exceed $10. With a little practice the axles may be easily balanced when they are picked up. —*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

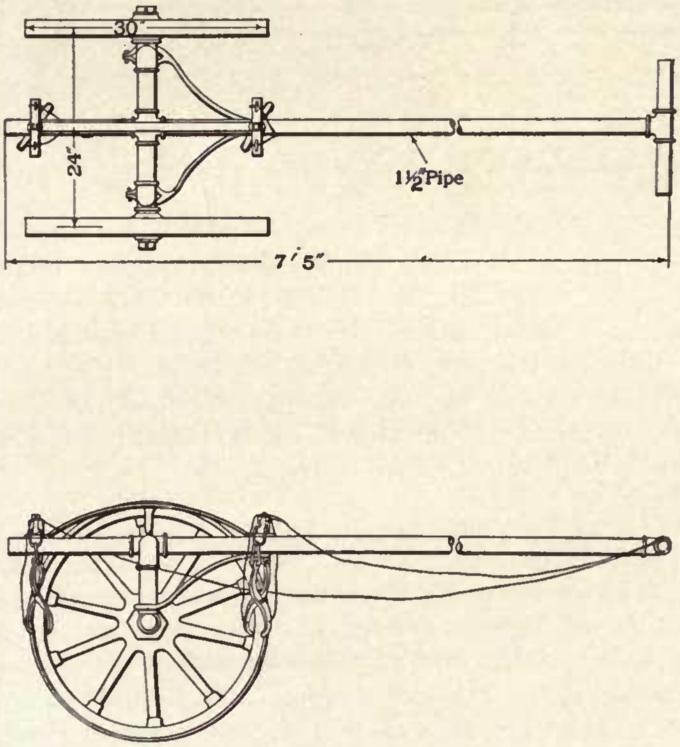



Fig. 579—Axle Truck.

BOLTS, RE-THREADING.

To the car repairman the two-piece die and die holder, shown in Fig. 580, are worth their weight in gold for running over old bolts that have become rusted or have battered ends. Instead of starting at the end of the bolt, as is done with the standard die, the two pieces are placed over the threaded portion, the holder is slipped over them and the die is screwed off the bolt.—*F. Rattek, Brighton, Mass.*

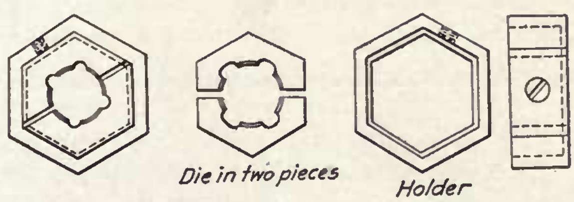



Fig. 580—Die for Repairing Mutilated Threads on Bolts.

BOLT SHEARS.

A serviceable device for a car repair yard is the bolt shearing machine shown in Fig. 581. It consists of a long lever *E*, pivoted at *G*, with a knife blade *F* bolted to it. The lever is operated by a 10-in. air brake cylinder. A piece of iron *D*, notched to receive ¾-in., ⅞-in. or 1-in. bolts, is bolted to the crosspiece; when air is supplied to the cylinder the knife shears the bolt. The whole mechanism is mounted in a wooden frame support and any car repairer can operate the machine, thus relieving the blacksmith shop of many small jobs.—*R. G. Bennett, Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

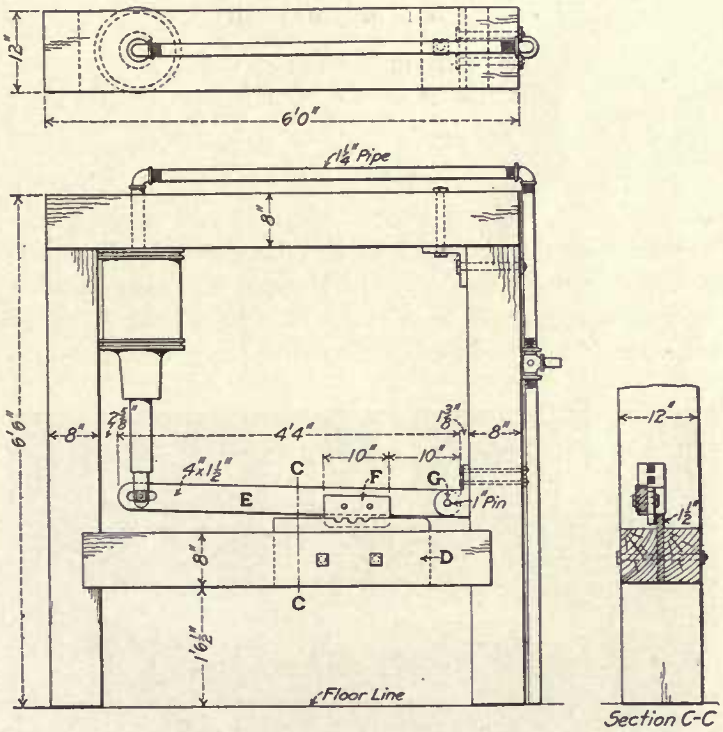



Fig. 581—Bolt Shearing Machine.

BOX CAR DOOR TRUCK.

A simple and handy truck (Fig. 582) is used for handling car doors about the yard. The door sets between the metal guides on the truck and one end wedges between the two parts of the wooden handle. The guides are constructed of ⅜ by 2-in. iron, as shown, and are bolted to the ¼-in. plate at the bottom, which is 6 in. wide and about 16½ in. long. The wheels are 9¾ in. in diameter.

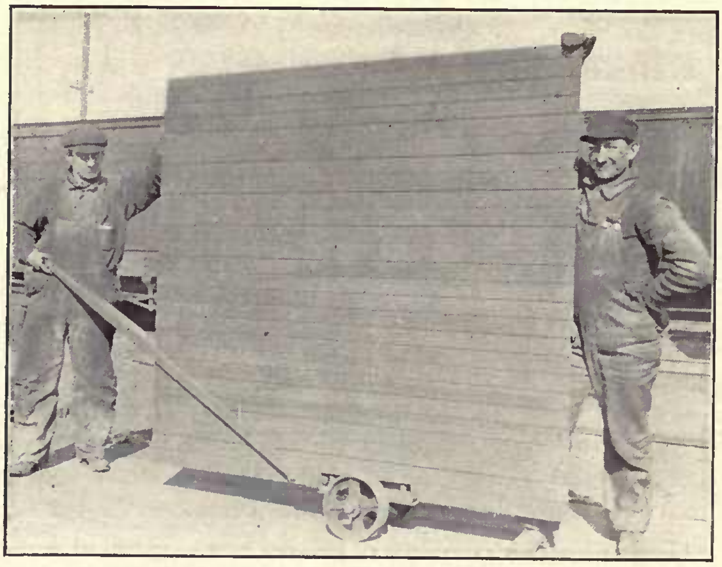


Fig. 582—Box Car Door Truck.

—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

BOX CAR DOORS, MAKING.

Accuracy and rapidity in the building of box car doors is secured by the use of a cast iron plate 3¾ in. thick and 7 ft. 3 in. wide by 8 ft. 6 in. long. On two sides, at right angles to each other, are flanges 2 in. high, as shown in Fig. 583. The door frame is laid on the plate, as shown by the photograph, and the siding is placed on it and nailed to it. Near the back of the plate will be seen what appears to be a boss with a handle on it. This is a cam which fits in a hole in the plate; it was intended

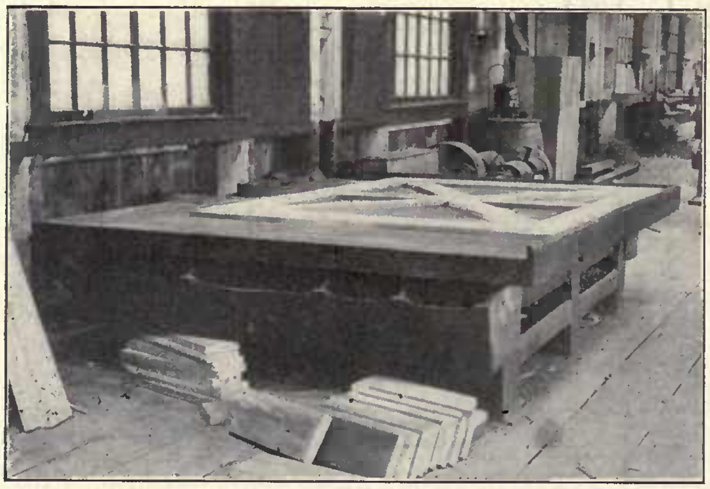


Fig. 583—Iron Table for Building Box Car Doors.

by turning the handle to force the siding boards tightly against each other and hold them there while they were being nailed on the frame. There were three of these cams. This practice has been discontinued, however, as it has been found that the dry lumber, when it becomes exposed to the rain and moisture, swells, with resulting injury to the appearance of the door. Underneath the table are a number of bins containing all the necessary nails, castings, screws, etc.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

BRAKE CYLINDER AND RESERVOIR WINDLASS.

A simple device, which is a time-saver in putting up air cylinders and reservoirs on new freight equipment, is shown in Fig. 584. The drum consists of a piece of 1½-in. pipe, 10 ft. long, the end of which is provided with an oak crossbar about 4 ft. long. This device is applicable only on new cars and is used before the flooring is laid. It is placed across the sills, and a piece of rope or chain is passed around the reservoir or cylinder, lying on the ground, and fastened to the windlass drum at the eye-bolts shown. By revolving the handle, the cylinder, or reservoir, is elevated to position. Using this device, two men can place the cylinders and reservoirs on six cars in 30 minutes.—*Guy A. Adams, Foreman, Boston & Maine, Concord, N. H.*

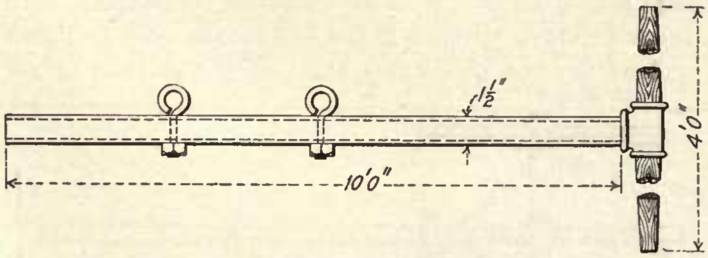



Fig. 584—Hand Windlass for Reservoirs and Brake Cylinders.

BRAKE CYLINDER AND RESERVOIR WINDLASS.

A handy device for elevating and holding the air cylinders and reservoirs of freight cars in place for bolting is shown in Fig. 585. The frame consists of two oak pieces, 1⅛ in. x 6 in. x 4 ft. 6 in. They are spaced about 48 in. apart by pieces of 1-in. pipe and are held rigidly

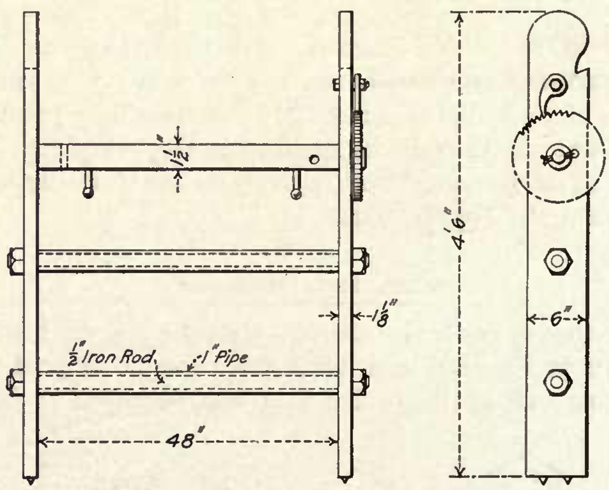



Fig. 585—Brake Cylinder and Reservoir Windlass.

together by ½-in. iron rods, which pass through the pipes. The tops of the uprights are rounded off and notched to grip the corner of the side sill. Metal points in the feet of the uprights prevent slipping. The drum of the windlass consists of a 1½-in. pipe, at the end of which is a ratchet and pawl. When using, the device is set up at the side of the car, the notches gripping the corners of the side sills. Two pieces of 1-in. rope, about 18 ft. long, are spliced to the two eye bolts on the 1½-in. pipe. The loose ends of these ropes are fitted with hooks. These ends are passed over the truss rod to the ground. The cylinder, or reservoir, is then placed on the ropes. the ends of which are passed up and hooked over a piece of pipe placed parallel to the side sill to which the cylinder, or reservoir, is to be bolted. This pipe extends from one cross or needle beam to another. The slack in the rope is taken up and the cylinder lifted to position by using a bar in the holes in the drum. With this device it is easily possible for two men to do the work, which formerly required three.—*Guy A. Adams, Foreman, Boston & Maine, Concord, N. H.*

### CAR BODIES, LIFTING.

A quick method of removing car bodies from their trucks at the repair track is the use of two air cylinders suspended on either side of the track, of sufficient height to permit the car being raised high enough to run the truck out. In this company's yard are two 14-in. air cylinders, suspended from a rigid steel structure. A car is run in on the repair tracks, the lifting hooks are placed under the side sills and in less than one minute from the time the rope is pulled, which is attached to the air valve that admits air to the cylinders, the car body is raised and the truck rolled out. This has been found to be a very economical and safe method of raising car bodies without the use of jacks.—*J. E. Osmer, Master Mechanic, Northwestern Elevated.*

### CENTER PLATE AND SIDE BEARING DEPTH GAGE.

A depth gage for adjusting center and side bearings on trucks is shown in Fig. 586. It consists of a piece of ⅞-in. material, 6 ft. long x 6 in. wide. The ends are shaped as shown in the drawing. An adjustable scale is

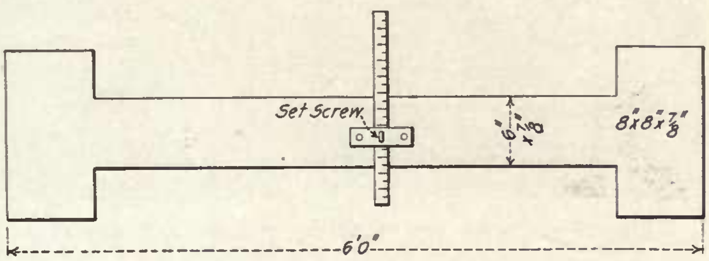



**Fig. 586—Center and Side Bearing Depth Gage.**

located at the center of the gage. In using this device the ends rest upon the side bearings. The scale is then moved into contact with the center plate, indicating the thickness of the liner required.—*Guy A. Adams, Foreman, Boston & Maine, Concord, N. H.*

### COUPLER KNUCKLES, RACK FOR.

In car repair yards where a large amount of work is done, including foreign cars, it is necessary to carry a large number and variety of coupler knuckles. As many of these knuckles do not differ greatly in construction, it is advisable to keep the different types piled separately and have them properly labeled, so that no time will be lost in finding the proper one. Because of their shape, it is difficult to arrange them to advantage without some means of support. The rack shown in Fig.

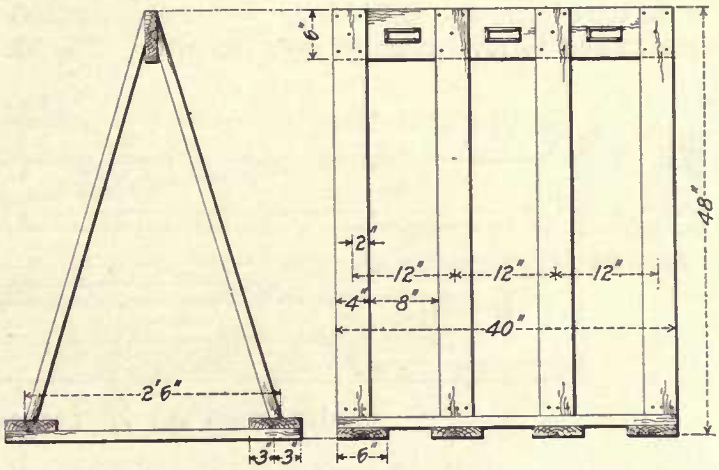



**Fig. 587—Rack for the Storage of Coupler Knuckles.**

587 has been devised for this purpose. A piece of tin, bent so that it will hold a card, is tacked about the top of each space and contains the name of the knuckle stored below. Besides adding to the neat appearance of the yard, the stock of knuckles can readily be accurately checked at any time without unnecessary handling.—*A. G. Pancost, Draftsman, Elkhart, Ind.*

### CRANE, PORTABLE.

A handy yard crane, operated by air and used in handling heavy material in the repair yard and for un-

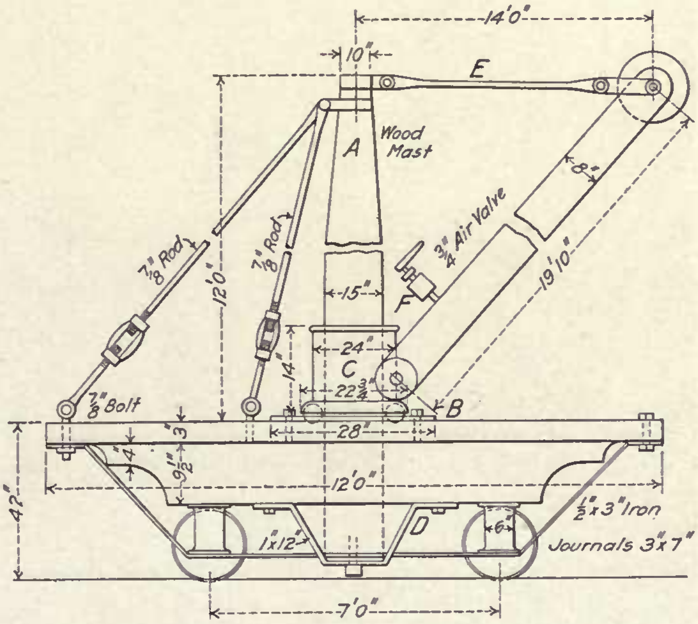



**Fig. 588—Portable Air Operated Crane.**

loading lumber, is shown in Fig. 588. Details of the air cylinder and boom are shown in Fig. 589. Our crane is used on 6 ft. gage track, but a similar car could be used equally well on standard gage, especially if outriggers or clamps were used when very heavy loads were handled. The car is of heavy wooden construction, well braced, and the mast is of oak, braced by a heavy bracket. The casting *C*, to which the boom is fastened, swings freely around the mast, operating on cast iron balls which fit in a groove or runway. A rope is fastened to the top of the boom for swinging it from side to side. The collar at the top of the mast, to which the tie rod *E* is attached, is arranged to revolve easily about the mast. The air cylinder is constructed of wrought iron pipe and is arranged so that air may be admitted at either end by means of the three-way valve *F*. The stroke of 7 ft. is doubled by weaving the chain around the sheave which is fastened to the end of the piston rod. As may be seen, the end of the piston rod is fitted with a crosshead which runs in guides, thus preventing the rod from being bent or distorted.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

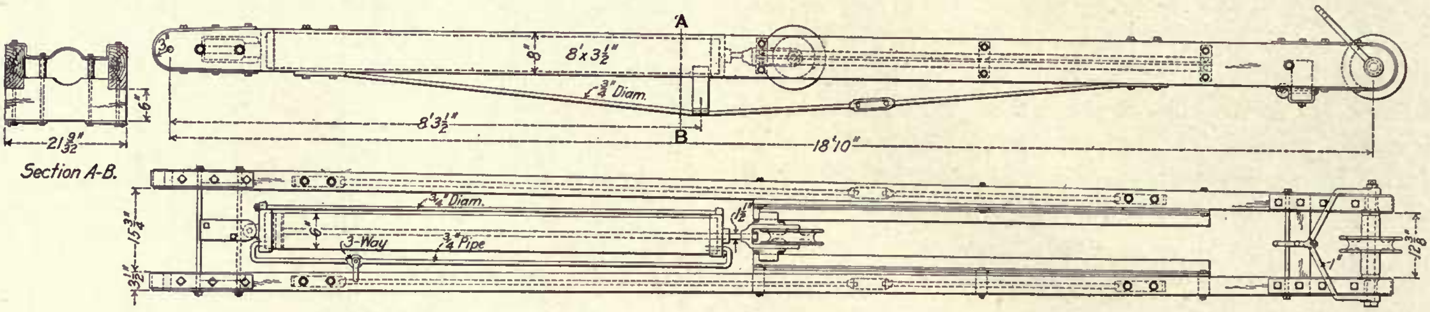



Fig. 589—Boom and Air Cylinder Used on Portable Yard Derrick.

CRANE, REVOLVING.

Several portable cranes are used for handling material about the plant. A pneumatically operated revolving crane, Fig. 590, is used for loading and unloading the heavier material such as wheels, trucks, bolsters, etc.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

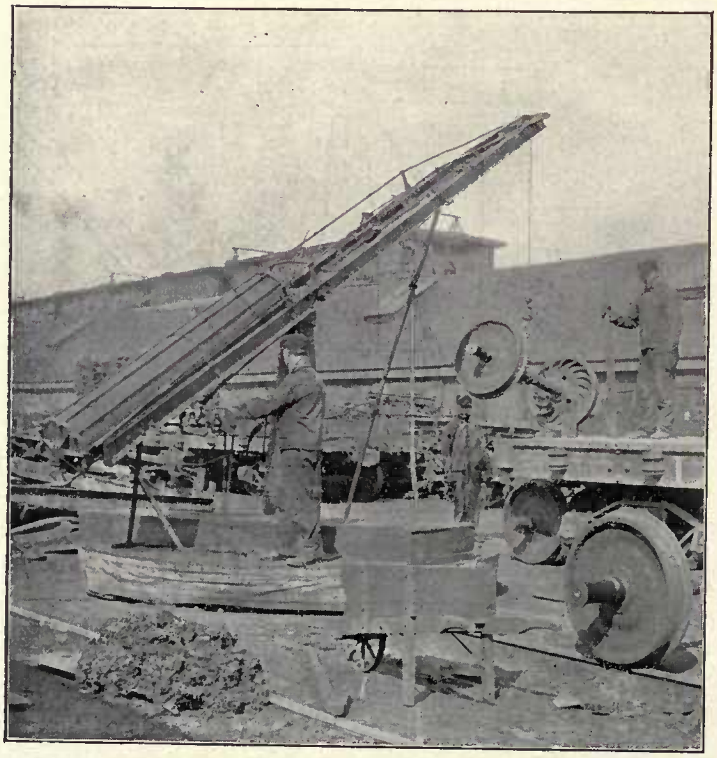


Fig. 590—Pneumatic Revolving Crane.

CRANE, REVOLVING.

Several types of cranes are used for handling material about the car yard. In Fig. 591 is shown a revolving crane on a truck; it is used for various purposes, including the handling of wheels, axles, etc. In the background of the same view is shown a gib crane with an air hoist for handling wheels. A large air operated crane placed on a flat car is used for loading and unloading heavy material. The division wrecking crane is located at this point and is also available for handling heavy material.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

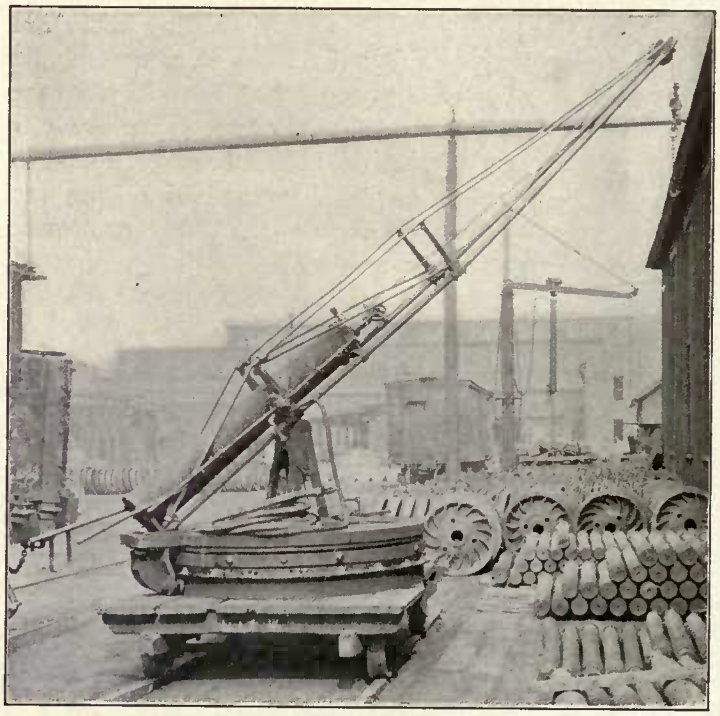


Fig. 591—Cranes for Handling Wheels and Axles.

DRAWBAR AIR LIFT.

A handy air lift, mounted on a low wagon and used to remove defective drawheads and replace new ones on tenders, cars. etc., is shown in Fig. 592. The wagon is rolled under the tender or car and the pistons are run up against the drawhead and yoke. The nuts are then removed and the drawhead lowered. The phanton illustration shows both the high and low positions of a drawbar

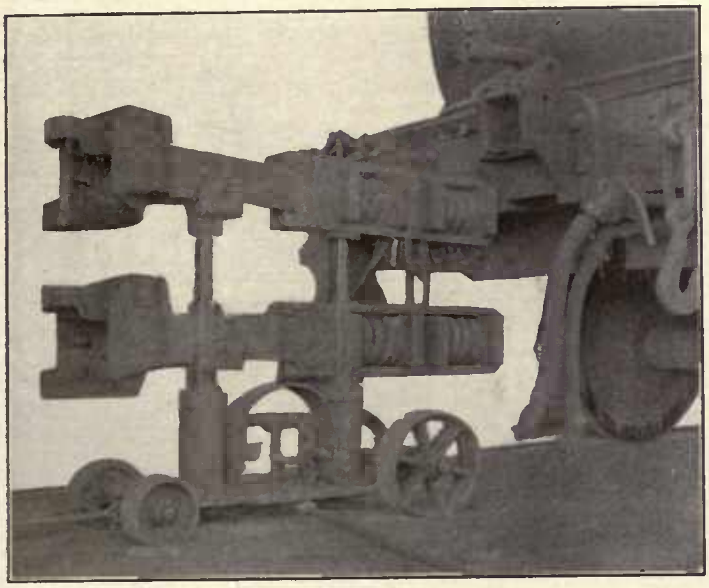


Fig. 592—Drawbar Air Lift.

on this lift.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

DRAWBAR, HOIST FOR RIVETING YOKE TO.

When riveting yokes on couplers it is desirable to have a special hoist by which the coupler may easily be handled and turned over. The hoist for this work, shown in Fig.

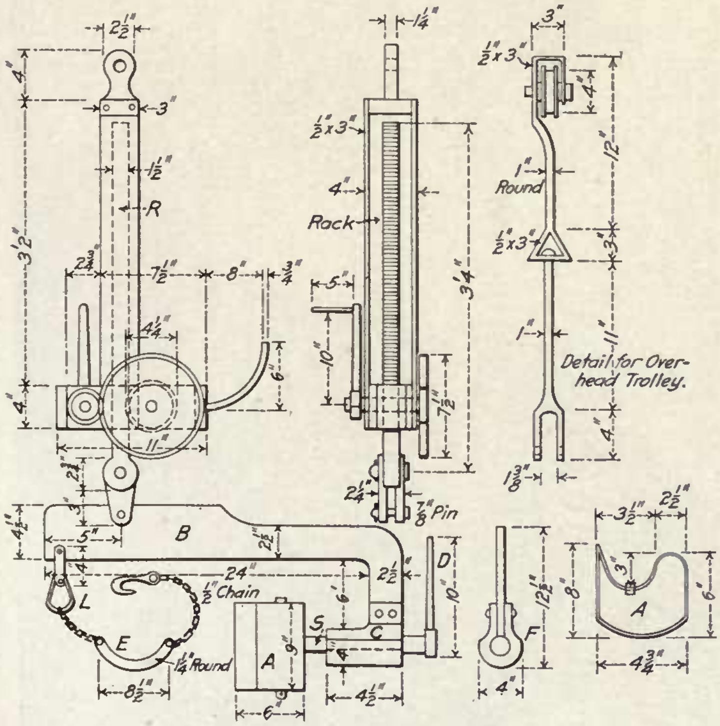



Fig 593—Hoist Used for Riveting Yokes on Couplers.

593, consists of two ½ in. x 3 in. pieces of iron, between which iron blocks are riveted at the top and bottom. The rack gear *R* is raised and lowered by the hand wheel and the gear which meshes with the rack. At the lower end of the rack is a wrought iron bracket *B*. The piece *A*, which is fastened to the spindle *S*, is made of ½ in. boiler plate and is so designed that it fits freely into the coupler and knuckle, and may be turned by the handle *D*. At the other end of the bracket *B* is suspended a piece of ½-in. chain. In lifting the coupler from the ground this chain is passed around the shank of the coupler, which rests in the piece *E*, and the hook at the end of the chain is slipped into the loop *L*. The coupler can be lifted to the proper height for riveting by operating the hand wheel and the rack *R*, and may easily be turned over or swung into any position under the hammer. A lug consisting of a piece of ¾ in. by 2 in. iron is riveted on the inside of *A* and is bent at one end, projecting beyond the edge of *A*. On the other end it extends far enough beyond *A* to allow a pin to be put in after the coupler has been dropped into place. This prevents the coupler from falling out when it is turned over. An overhead trolley, the details of which are shown in the drawing, may be constructed, so that the coupler can readily be carried to and from the hammer.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

DRAWBAR YOKE RIVETS, SHEARING.

A hydraulic press, or shear, designed at the East Buffalo shops, has recently been installed for shearing off coupler yoke rivets and is giving satisfactory results.

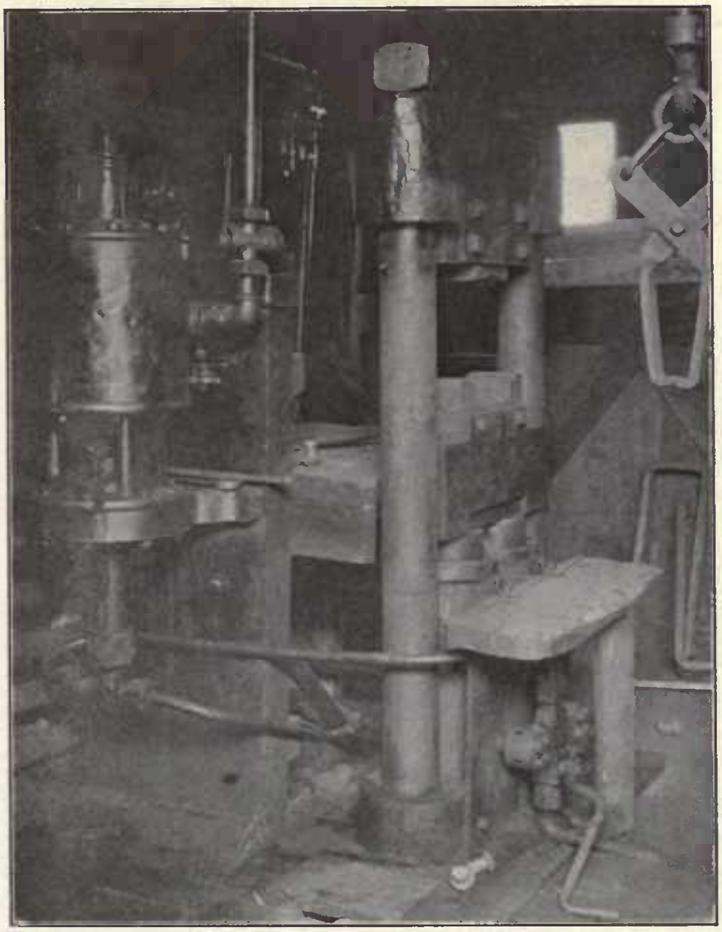


Fig. 594—Hydraulic Press for Shearing Off Coupler Yoke Rivets.

The rivets are sheared at both ends where the yoke fits against the coupler. The body of the rivet drops out of the coupler end, and the two ends of the rivet either drop out, or may be easily knocked out of the yoke. The disadvantage of most devices designed for doing this work is that they cut the rivet head off at one end only, and if both of the rivets are not headed up on the same side, it is almost impossible to drive one of them out. With this machine, although the work is done quickly, there is no danger from flying parts as with a drop machine.

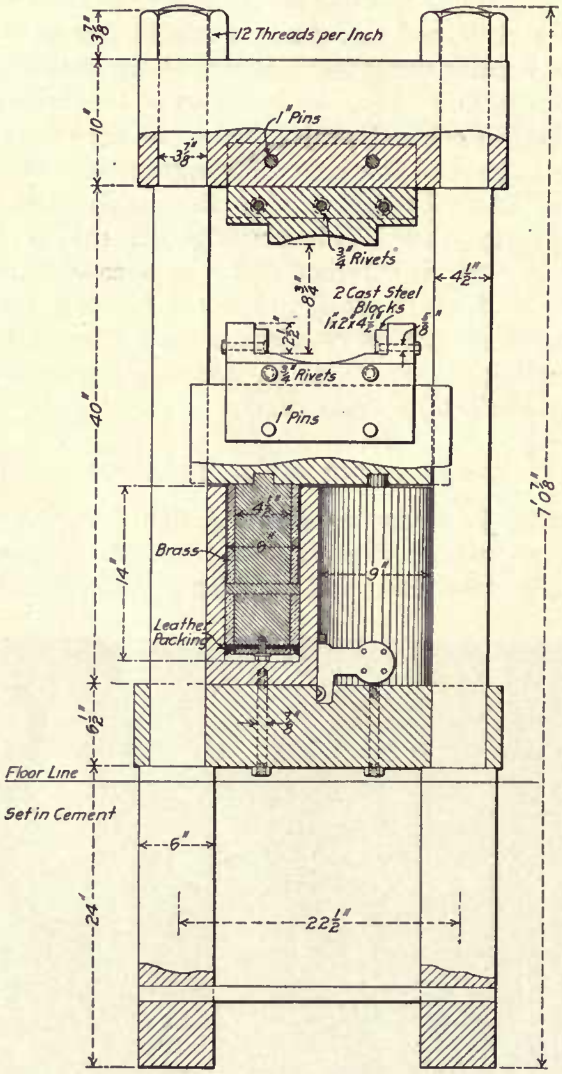



Fig. 595—Hydraulic Press for Removing Yokes from Couplers.

The apparatus is shown in detail in Figs. 594, 595, 596 and 597. The columns of the machine are forged from old axles. The coupler is raised by an air hoist on a gib crane and the yoke is slipped into place as shown in Fig. 597. Water is admitted to the cylinders by the three-way cock (Fig. 596) and the ram is raised so that the coupler is forced against the top die, or former, as shown in Fig. 597. By means of the three-way valve the connection to the main water supply line is then cut off and the pressure in the cylinders is increased by starting up a 9-in. locomotive air pump, the lower part of which has been bushed down to 15/16 in. and is connected by a T and two check valves to the water supply line and the cylinders of the press. From 10 to 14 strokes of the air pump are re-

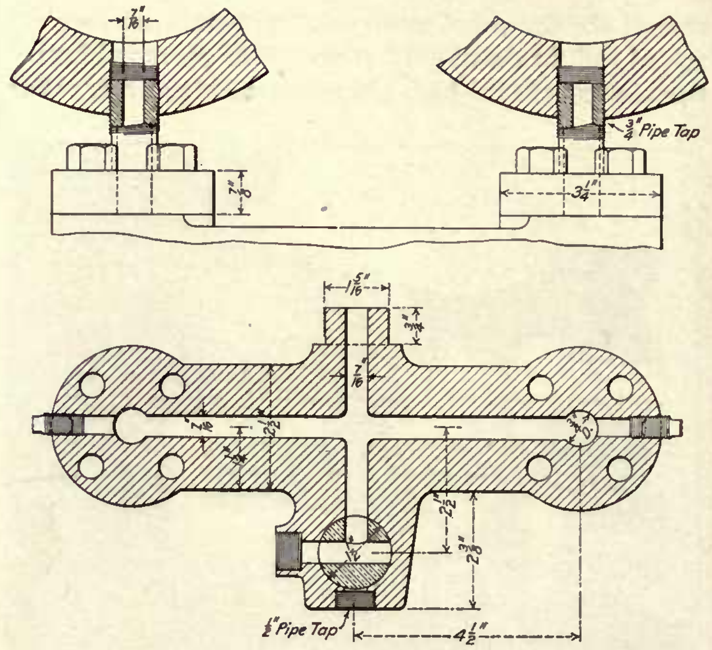



Fig. 596—Three-Way Valve on Hydraulic Press.

quired to increase the pressure in the cylinders sufficiently to shear off the two $1\frac{1}{8}$-in. rivets at both ends. The air pump is then shut off and just enough water is drained from the cylinders to allow the yoke and coupler to be

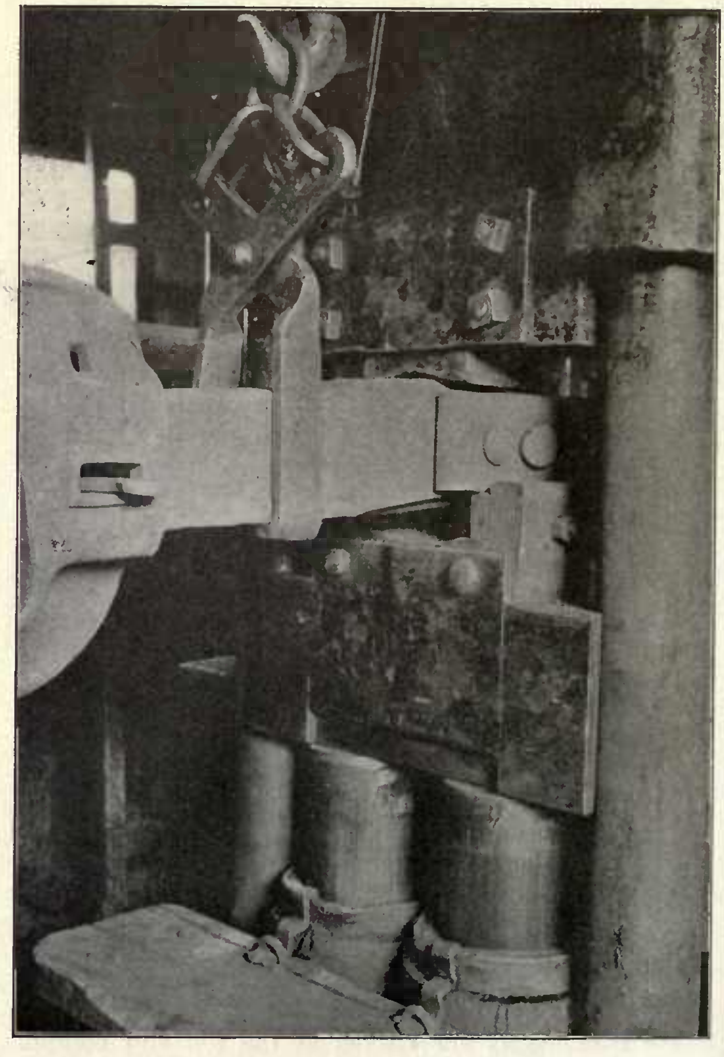


Fig. 597—Coupler Yoke Rivets About to be Sheared.

removed and another one to be slipped into place.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

### DRAWBAR YOKE RIVETS, SHEARING.

A simple device for shearing yokes from couplers is shown in Figs. 598 and 599. The machine consists of a cast steel hammer, weighing 1,570 lbs., which may be raised to any desired height by means of an 8-in. air cylinder; it is tripped by a tripping attachment coming in contract with a ¾-in. rod which is passed through two eye bolts fastened to the guides of the hammer. The movable block and spring near the top of the guides absorbs the shock of the tripping device as it flies up after releasing the hammer. The drop of the hammer is regulated to 9 ft. in summer and 8 ft. in winter. One blow shears the yoke from the coupler; occasionally a malleable iron coupler is damaged, but never a cast steel one. The time and labor saved by this machine, however, compensate for any loss of this kind. The machine may be operated by one man stationed at the cylinder, who,

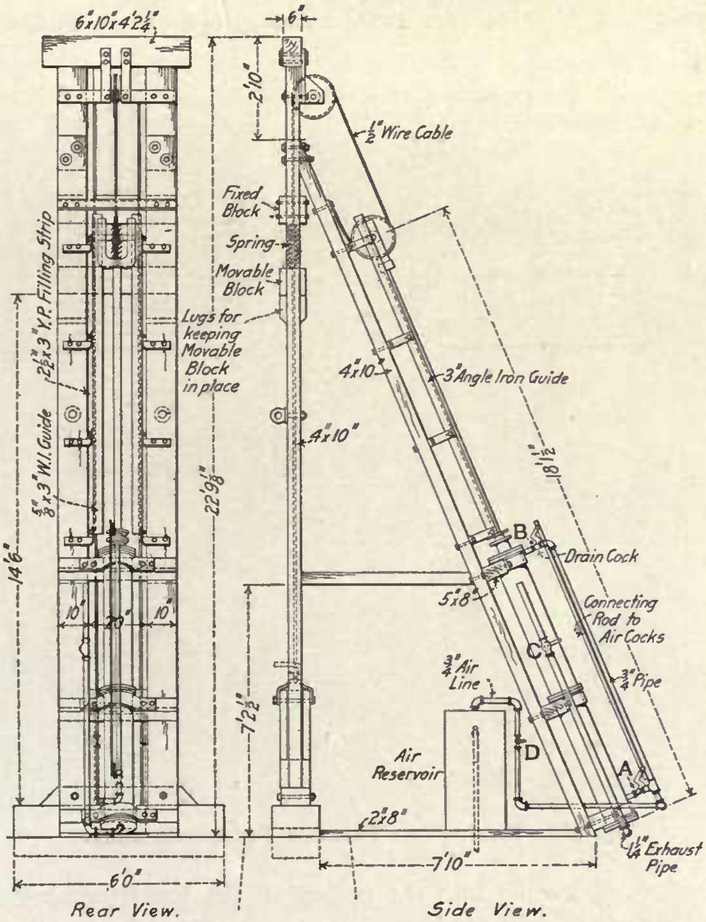



Fig. 598—Trip Hammer for Shearing Yokes from Couplers.

by operating the rod connecting the air cocks *A* and *B*, and opening and closing the valve *C* in the exhaust pipe, may raise and lower the hammer at will. To operate the hammer move the connecting rod to close the valve *A* and open the valve *B*, thus admitting air at the top of the cylinder. When the hammer is tripped, move the connecting rod in the opposite direction, which opens valve *A* and closes valve *B* at the same time. A hole drilled in the side of valve *B* permits the upper part of the cylinder to drain, thus relieving the pressure ahead of the piston. Exhaust valve *C* is used to exhaust the air from the cylinder after the piston is moved to the starting position. It is closed when lifting the hammer, to give the required dash-pot action. Air is taken from an air reservoir through the valve *D*, which should be closed when the

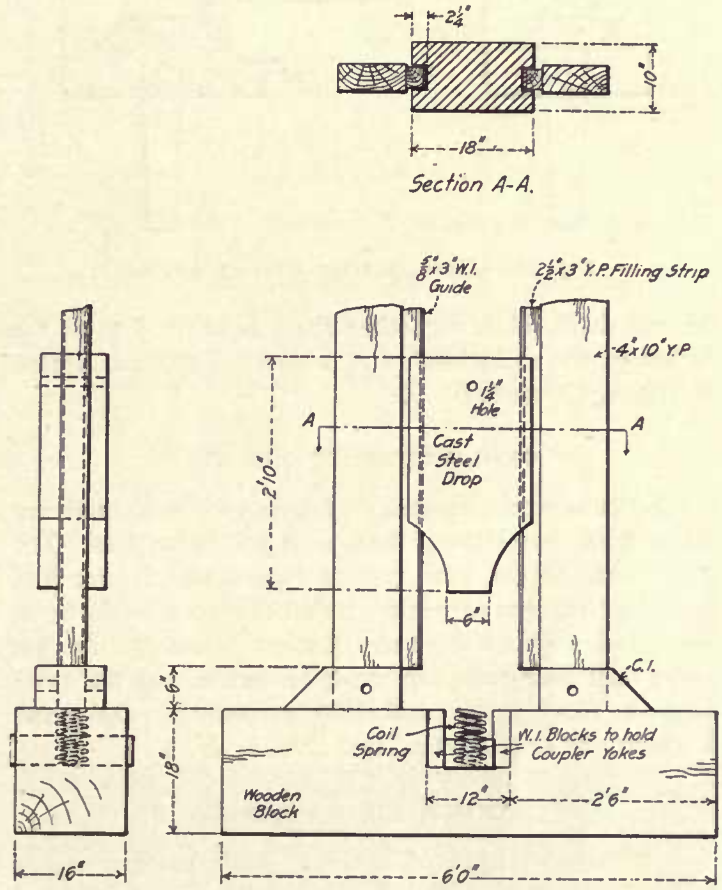



Fig. 599—Base of Device for Removing Yokes from Couplers.

machine is out of use. Air is used from the shop line at about 100 lbs. pressure.

Fig. 599 shows a partial front elevation of the lower part and base of the apparatus, including the blocks and spring on which the yoke with its coupler is placed for shearing. Before placing the coupler and yoke in the apparatus the hammer is raised slightly and is then lowered until it rests on a movable arm which may be swung under it. The workmen are thus protected from the accidental falling of the weight while they are placing or removing couplers in or out of the device. When air is admitted to the cylinder and the hammer is raised the arm is automatically swung out of the way. This device was first seen at the shops of the Union Rairoad.—*R. G. Bennett, Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

### DRILLING, CLOSE QUARTER.

The device shown in Fig. 600 is used for doing close-quarter drilling in connection with the work of splicing sills. That porton of the sill which remains on the car cannot be reached without some device of this kind. The bevel gears are 1 in. in diameter and are enclosed in a light casing. In using, the casing is held in the right hand and the Little Giant motor in the left hand. A short shank is welded on the bit, and is held in the socket

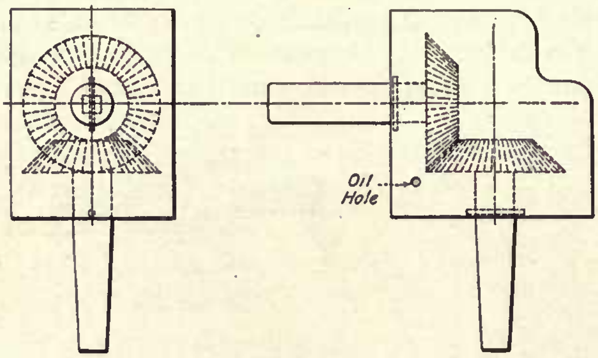



**Fig. 600—Close Quarter Drilling Angle.**

of one shaft, while the other shaft is tapered to fit the socket of the motor.—*Guy A. Adams, Foreman, Boston & Maine, Concord, N. H.*

GANG, NUMBER OF MEN IN.

The men work in gangs of two men each and are divided into two classes, truck men and carpenters. The truck men do the work on the trucks, underframe and draft rigging; the carpenters do all the work on the roof, sides and floor of the car. Except in emergency, not more than four men can work on one car at the same time—a truck gang and two carpenters.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

HAMMER, CAR INSPECTOR'S.

A convenient form of car inspector's hammer, made of low grade steel, with a hooked end for lifting journal

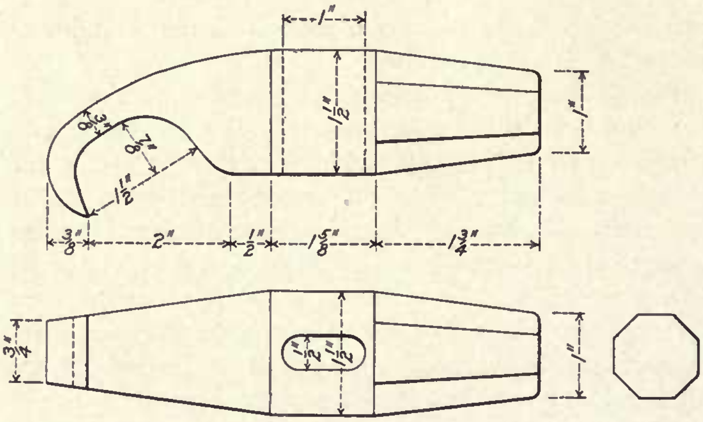


**Fig. 601—Car Inspector's Hammer.**

box lids, uncoupling steam hose, and useful for a variety of purposes, is shown in Fig. 601.—*C. C. Leech, Foreman, Pennsylvania, Buffalo, N. Y.*

GOUGE, HANDLE.

A handle gouge for cutting channelways for truss rods, on the under side of flooring and across body bolsters or transoms of freight cars is shown in Fig. 602. It is made from an ordinary Dabber's adz, the blade of which is dressed into the semi-circle, as shown, with about ¾ in. radius. This tool is very popular, doing the work which

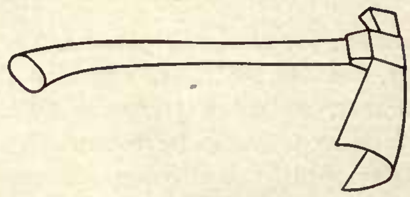


**Fig. 602—Handle Gouge.**

formerly was performed with a mallet and hand gouge. —*Guy A. Adams, Foreman, Boston & Maine, Concord, N. H.*

JACK, PORTABLE.

A 12-ton portable air jack, with a 20 in. lift, which may be used to advantage in the car repair yard, is shown in Fig. 603. The cylinder is of cast iron, 18 in. in diameter inside. The wheels are mounted on an axle that fits in the wrought iron bracket, which is clamped to the cylinder. A wooden handle, 60 in. long, is flattened at one

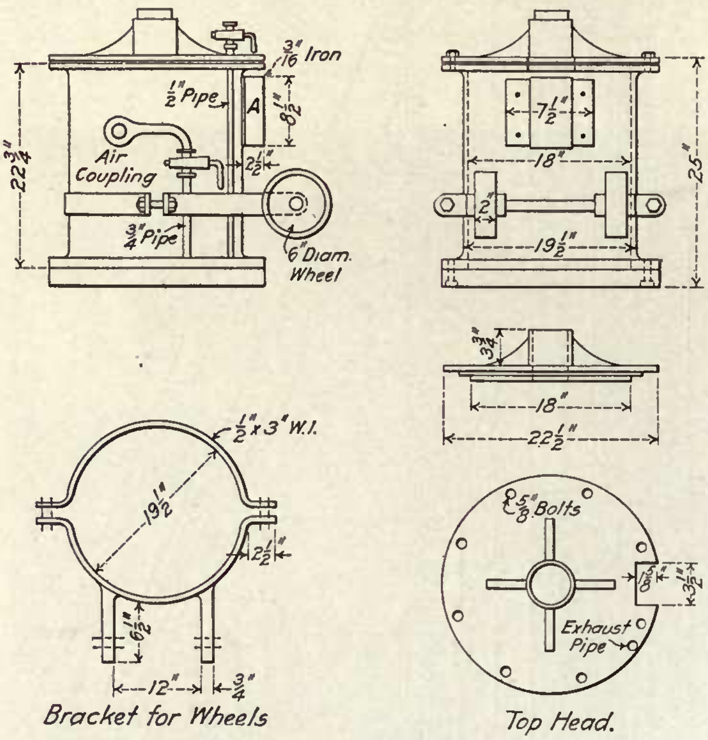



**Fig. 603—Twelve-Ton Portable Pneumatic Jack.**

end to fit loosely into the pocket *A*, the top flange and cover of the cylinder being cut away to clear the handle. The jack can thus be readily moved about the yard. An air coupling is provided for connecting it to the air line. —*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

JACK BUGGY.

An iron buggy used for handling a 290-lb. jack, is illustrated in Figs. 604 and 605. The ends of the fork or claws are turned up slightly to prevent the jack from slipping. The wheels have wide treads, but are not

Fig. 604—Lifting the Jack on the Buggy.

heavy. One man can easily handle a jack with this buggy. It is made high to permit placing the jack on a

Fig. 605—The Jack in Position on the Buggy.

16-in. block direct from the buggy.—*F. J. Cook, Foreman, Car Department Smith Shop, St. Louis Southwestern, Pine Bluff, Ark.*

INSPECTOR'S EMERGENCY REPAIR CART.

At terminals where all trains change engines and crews, and the inspectors are allowed only from two to ten minutes to thoroughly inspect the train, speed and accuracy are required on the part of all concerned in order that the train may leave the terminal on time and in safe condition. It is necessary to have any tools or repair material that may be needed close at hand. A cart, which contains an emergency equipment, used for making speedy repairs to hot boxes, is shown in Fig. 606. This is always kept near the station and contains dope cans,

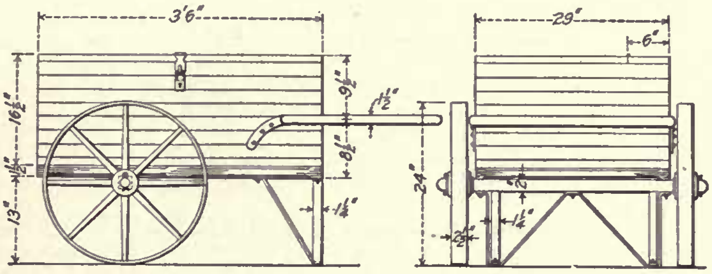



Fig. 606—Car Inspector's Emergency Repair Cart.

waste, oil, special packing tools, jacks, blocking, extra journal brasses, etc. The use of this emergency cart has made possible the prompt handling of repairs to hot boxes.—*A. G. Pancost, Draftsman, Elkhart, Ind.*

JACKS FOR LOADED FREIGHT CARS.

All of the jacking up and lowering of loaded cars is done by two men with two air jacks; these are shown in position at one end of a loaded car in Fig. 607. The inside diameter of the air cylinders is about 20 in. and the stroke is 22 in.; the piston rods are 4 in. in dameter. The air supply for both cylinders is controlled by one valve, so that the pressure is equalized and both jacks work to-

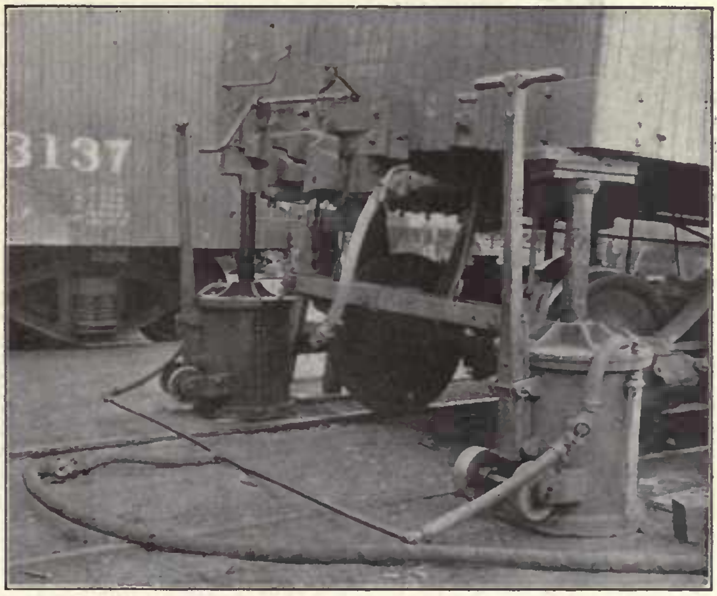



Fig. 607—Air Jacks for Loaded Cars.

gether. While the jacks are quite heavy, the men seem to have no trouble in handling them about the yard. The empty cars are jacked up by ratchet jacks by the gang of men working on the car.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

JOURNAL BEARING, EMERGENCY.

The journal brass shown in Fig. 608 may often be used to splendid advantage for curing or overcoming a hot box without replacing the axle, provided the journal is not too far gone. The repairman must, of course, use good judgment. Instead of holding the car and removing the wheels, it is often possible to save the journals for

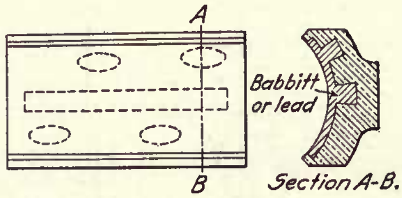



**Fig. 608—Emergency Journal Bearing.**

several thousand miles additional service by applying the brass shown. It has a babbitt lining, which is cast on an arbor the same diameter as the journal on which it is to be used. It must not be bored, filed or fitted, and must not be used on newly turned journals.—*F. Rattek, Brighton, Mass.*

JOURNAL BOX PACKING CART.

A special cart, Fig. 609, is used in connection with the repacking of journal boxes. The wooden box is lined with galvanized iron. The old packing is pulled out of

**Fig. 609—Cart for Journal Box Packing.**

the journal box and dumped into one end of the cart; fresh waste for repacking is taken from the other end.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

JOURNAL BEARINGS, RECLAIMING.

Many car repair yards follow the practice of putting new bearings in journal boxes when a pair of wheels is changed. Very often the old bearings are only slightly worn and are good for considerable more service. Ordinarily the journals from which they are removed are worn smaller than the standard and the bearing, when placed on another journal, will not fit down on the crown. In order to use the bearings again it is necessary to refit them to the journal so that they will have a proper bearing. The device shown in Fig. 610 has a number of rollers of different diameters. The operator covers one of these, which corresponds to the diameter of the journal

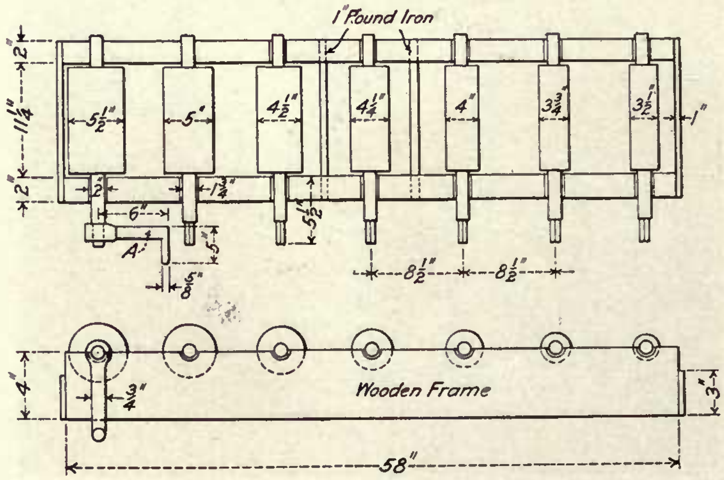



**Fig. 610—Rollers Used in Refitting Journal Brasses.**

for which he wishes to use the brass, with black lead, after which he pleaces the bearing on the roller and turns it by means of the handle *A*. The bearing is then removed to a convenient bench fitted with a clamp so it may be held rigidly while it is being scraped.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

JOURNALS, POLISHING.

It is often necessary to re-turn the journals on car axles and after doing this they should be polished with emery. Fig. 611 shows a simple but efficient device for this purpose. The two wooden pieces are of well-seasoned oak or hickory. The operator places the blocks about the journal, as shown, and drops the leg which is

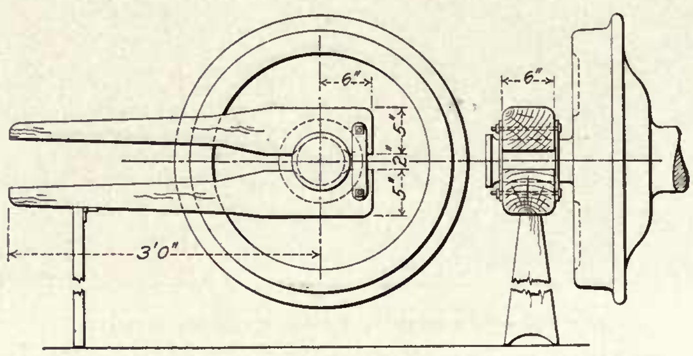



**Fig. 611—Device for Polishing Newly Turned Journals.**

hinged to the lower block. Two sheets of fine, well-oiled emery cloth are inserted between the blocks and the journal; the lathe is started up and the operator places his weight on the outer end of the top block. In a short time a smooth, polished surface is obtained.—*A. G. Pancost, Draftsman, Elkhart, Ind.*

JOURNAL BOXES, DRILLING.

In rebuilding old freight cars to a capacity greater than that for which they were originally designed, it is necessary to strengthen the trucks, using heavier arch bar material, and heavier arch bar bolts. The rigging shown in Fig. 612 is used in connection with drilling the bolt holes in the journal boxes larger. The journal box is held in position by a block wedged against one foot of the upright. A guide, or template, is used in drilling, to prevent the drill from running to one side in the hole as

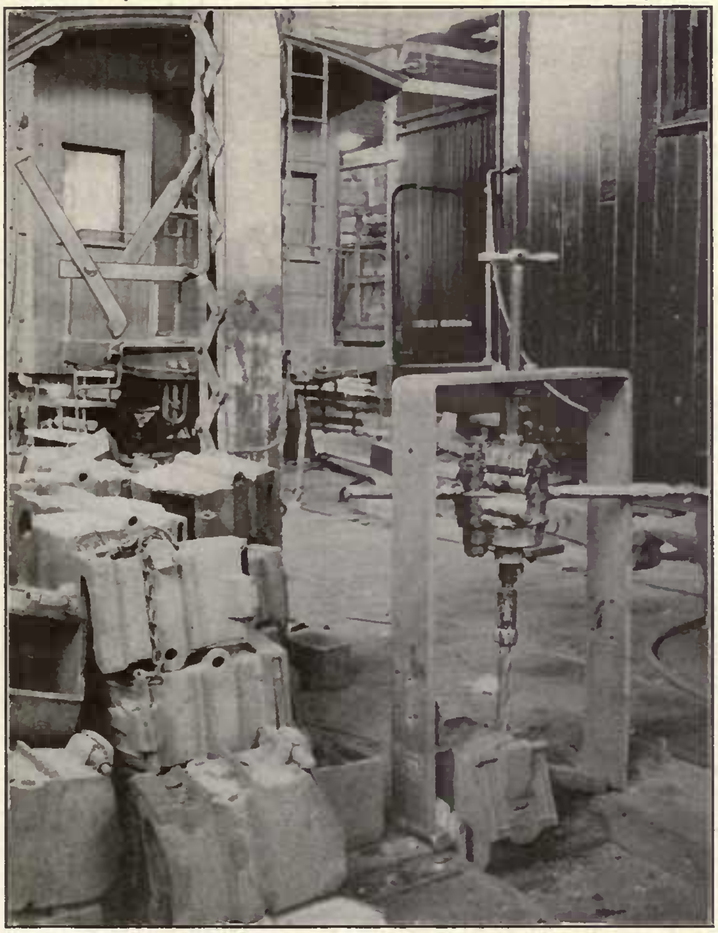


**Fig. 612—Device Used for Drilling Journal Box Bolt Holes; also Metal Scaffold Bracket Used in Freight Car Shop.**

it would be very apt to do otherwise, since the work is practically reaming rather than drilling. Flat-twisted, high speed drills are used.

*Scaffold.*—Hooked over one of the cross-ties of the building column is shown an all-metal scaffold bracket used in the freight car shop. The extension arm is shown partly thrown up, to illustrate the fact that it may be moved up out of the way to prevent its being struck by a passing car when not in use; this feature is quite important.—*Lehigh Valley, Sayre, Pa.*

LOCKERS.

An expanded metal locker is provided for each workman in the shops and the repair yard. These lockers are placed in the freight car shop and are 1 ft. wide, 1 ft. deep and 5 ft. high inside. They are examined three or four times a week to see that no inflammable material is allowed to accumulate in them. They were manufactured and furnished by Merritt & Co.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

MATERIAL, STORAGE.

Car inspectors in charge of the work in a large yard must be prepared at any moment to shoulder their tools and look over a train that is either entering the yard or preparing to leave it. The inspector does not, of course, know just what material he will need for repairs, and if he did he would probably be unable to carry it for any great distance. It is therefore desirable to provide some arrangement for storing a limited supply of the parts which are most often required convenient to the place where repairs may have to be made. This is particularly true in the case of such articles as air hose, knuckle locks, pins, cotters, bolts, etc. A box, similar to the one shown in

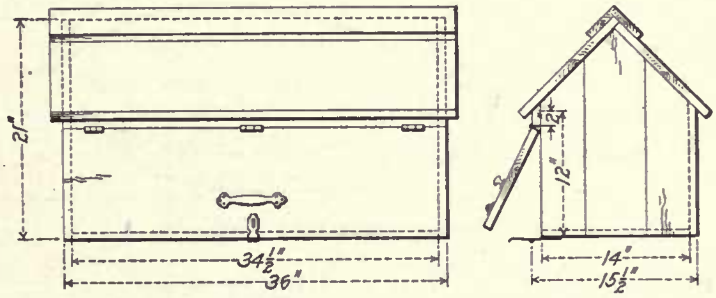



**Fig. 613—Box for Storage of Car Repair Material.**

Fig. 613, may be used to good advantage for storing such material. These boxes are placed on two ties partly sunk in the ground, and are located from 150 to 250 ft. apart on the side of the yard that is most convenient to the workmen and about 8 ft. from the track. In addition to these small boxes, others, about three times as large, are placed from 500 to 600 ft. apart, alongside of the yard, and are used for the storage of oil, waste and heavy tools. These centers for supplies may also be used as dumping places for scrap material which is gathered up about the yard and is picked up by a work train at regular intervals. This method of storing material in a convenient place for the repairmen not only enables them to do more and better work, but prevents the material from being scattered promiscuously through the yard and being lost or destroyed by exposure to the weather. —*A. G. Pancost, Draftsman, Elkhart, Ind.*

NAIL PULLER AND COMBINATION BAR.

The combination steel bar and nail puller shown in Fig. 614 is a most convenient tool for use in a car repair

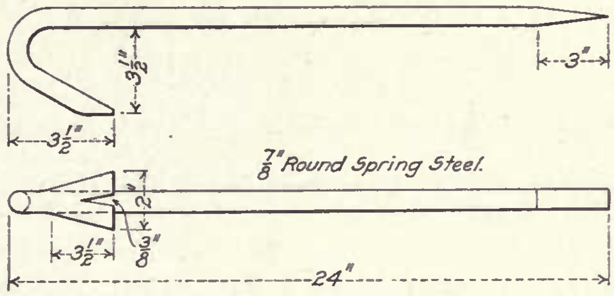



**Fig. 614—Combination Steel Bar and Nail Puller.**

yard; it may also be used for removing small bolts.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### PINCHERS, CAR INSPECTOR'S.

Few tools used by car inspectors can be put to as many uses as the pinchers shown in Fig. 615. The tool weighs very little and may be carried in the pocket without inconvenience. The two parts are forged from a good grade of tool steel and may be polished if desired. The end of one part of the handle is tapered to a sharp point, while the other is flatened and shaped for use in pulling

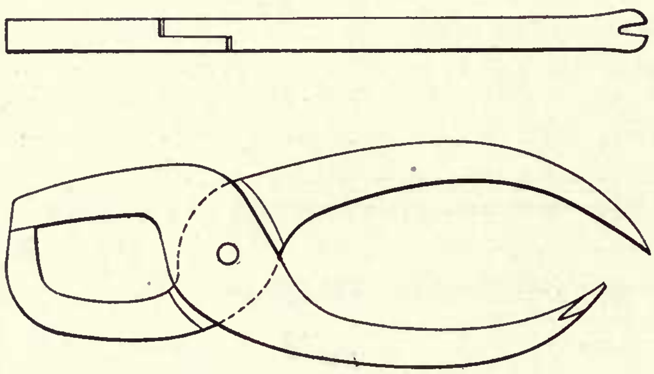


**Fig. 615—Car Inspector's Pinchers.**

tacks. The tool as it is used for removing a rubber gasket from an air or steam hose is shown in Fig. 616. Every inspector is familiar with the trouble that is experienced in removing these gaskets, especially old ones, which often stick in the recess. Should any of the pieces of gasket, dirt or scale remain in the recess, they can easily be removed by inserting the sharpened end of the handle and scraping them off. In placing a new gasket in the coupling it is necessary to double it up and force it through the opening, which is, of course, considerably smaller than the overall diameter of the gasket. In some instances the gasket does not fit properly in the recess and kinks up. By placing the nose of the pinchers in the

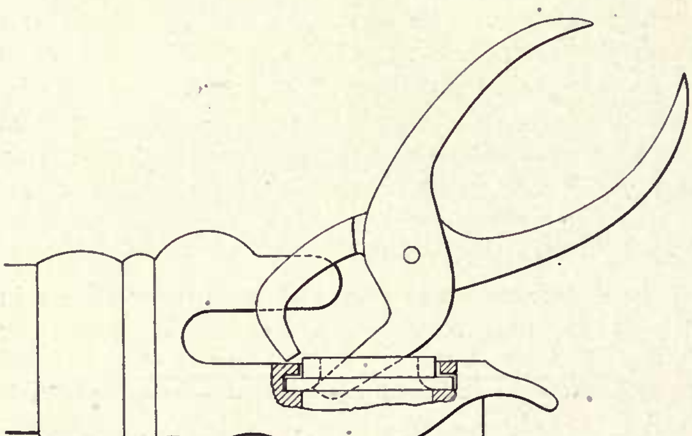


**Fig. 616—Removing a Gasket from Air Hose Coupling.**

opening in the gasket, as shown in Fig. 617, and turning the tool around several times, pressing down at the same time, the gasket may be spread and forced into the proper position. In replacing broken glass on cars it is often necessary to remove moldings. This can be done without injury to the molding by the use of the pinchers, as shown in Fig. 618. The tack puller end of the handle can be used to pry up the molding and loosen the brads. The latter can then easily be pulled out. The pinchers are useful in breaking off rough edges of glass which

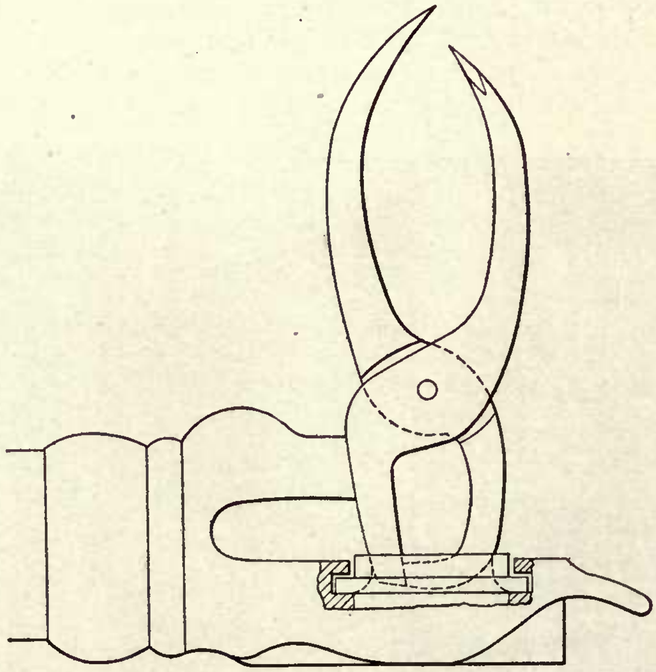


**Fig. 617—Forcing Gasket to Seat Properly.**

fail to come off at the line made by the cutter. Car inspectors do not like to carry tacks with them. When equipped with these pinchers it is not necessary to do so, for they can easily remove a tack from the side of a car

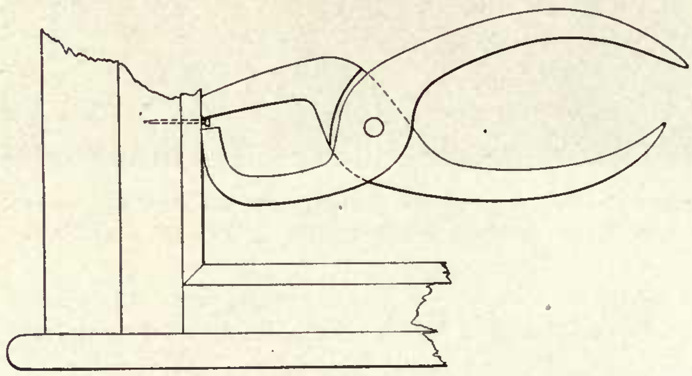


**Fig. 618—Removing Brads from Molding.**

at any time it is needed. Flat places are left on the pinchers so that they can be used to advantage in driving tacks.—*A. G. Pancost, Draftsman, Elkhart, Ind.*

### SCRAP, RECLAIMING.

All scrap material gathered on the division is shipped to the East Buffalo shops and sorted into different classes. It is carefully examined by an expert and such parts as are fit for use are transferred to what is known as a second-hand platform. When material is taken from this platform no charge is made against the car for it. At one end of the platform is a shed containing a hydraulic machine for cutting off the coupler yoke rivets; beyond this is a small blacksmith shop where bent or broken parts are straightened and repaired, and yokes are riveted to couplers.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

### TIMBER HOIST.

Large timbers are often loaded in gondola or hopper cars and are difficult to unload unless some special provision is made for so doing. For this purpose a stationary

**Fig. 619—Timber Hoist.**

hoist extending over two tracks is used, as shown in Fig. 619. The timber is unloaded from the cars and placed on lorry trucks and transferred to any part of the yard. The cylinder on the hoist is 12 in. in diameter and has a stroke or lift of 8 ft. It is operated from the platform

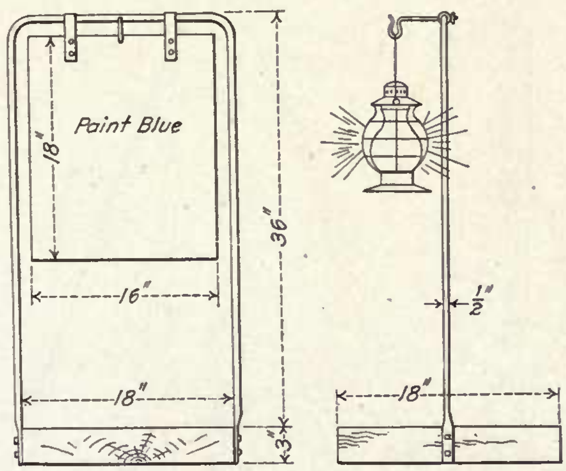



**Fig. 620—Substantial Signal for Use of Car Repairmen.**

at the right by the use of an old engineer's valve. The cylinder is supported by a small carriage, which operates on two sheaves on a track of bar iron.—*Erie Railroad, Buffalo, N. Y.*

### SIGNAL, CAR REPAIRMEN'S.

Repairmen who are working on cars standing on tracks which lead to other parts of the yard should be protected by a conspicuous and substantial signal in order to caution trainmen against entering the repair track either with other cars or with a switching locomotive. The ordinary flag is unsatisfactory, as it soon becomes solid and may easily be lost, torn or blown away by the wind. To overcome this, the signal shown in Fig. 620 has been constructed. The block which forms the base is heavy and insures the signal remaining in an upright position. One of these signals is left near each end of all entrance tracks to the repair yard and is always at hand when required. When in use it is placed in the center of the track. The banner should be painted occasionally, but this is the only attention which it will require.—*A. G. Pancost, Draftsman, Elkhart, Ind.*

### TRESTLE FOR CAR REPAIR YARD.

A specially good trestle for supporting car bodies is shown in Fig. 621. It is substantial, durable and may be placed so that it will clear the trucks, allowing them to be run out from under the car. The base is made in the form of a T, the long member being placed nearest the car and parallel to it. The trestle is constructed entirely

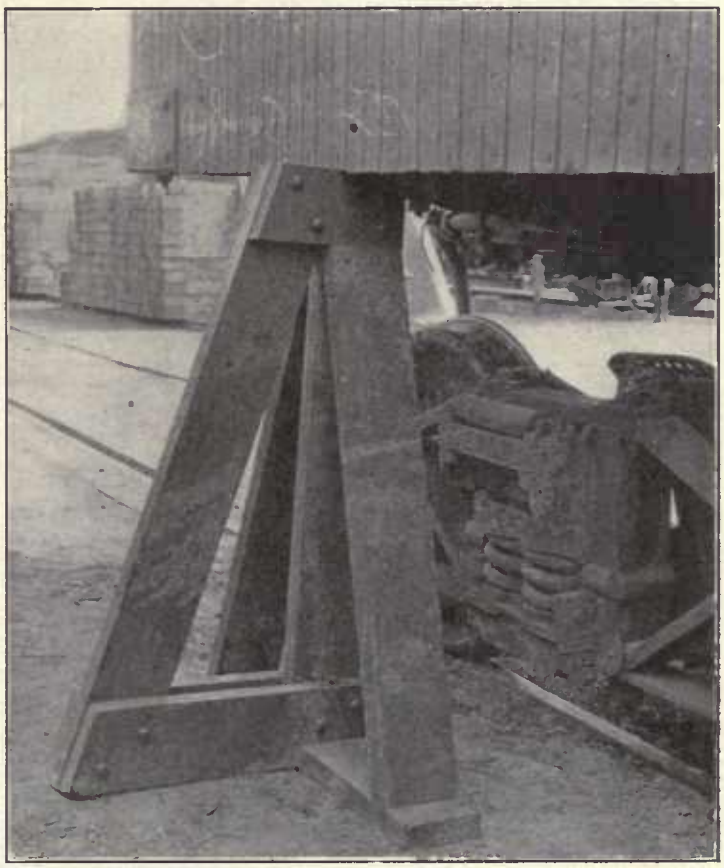


**Fig. 621—A Good Trestle for the Car Repair Yard.**

of 1¾-in. x 6-in. timbers, except for a 1¾-in. x 3-in. piece which ties the legs together at the front and about half way up. The base plank at the front is 3 ft. long. The rear leg extends back 2 ft. from the front of the trestle. The flat surface at the top is 5¾ in. x 10½ in. and the trestle stands 3 ft. 10 in. high—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

#### TOOL BOXES, CARE OF.

Considerable friction developed at one time because of the workmen stealing tools from each other's boxes. These boxes are of the usual type, 12 in. x 7½ in. x 24 in. over all, with half of the top and half of one side open. To overcome the difficulty three compartments or closets were built in one corner of the freight car shop, each about 9 ft. long and containing two shelves, making three divisions in each. Each workman's tool box is numbered and must be put in a certain place in one of the compartments when he finishes his work in the evening. The man in charge locks the compartments when the boxes have been placed in them. If any of the men work overtime, the night watchman sees that the boxes are properly put away. In the morning the men take out their boxes when they start to work and if any boxes remain the compartment is locked so that the contents cannot be tampered with. This scheme is giving splendid results.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

#### WHEEL AND AXLE HOIST.

An overhead traveling hoist used for loading and unloading mounted car wheels is shown in Fig. 622. It consists of two tripods, the legs of which are made of 3-in. gas pipe, and are fitted to cast iron shoes at the bottom. These shoes rest on blocks of stone 20 in. square, which are let into the ground and set in concrete. The bolts which hold the shoes are let into the stone and leaded. The castings at the top are made to hold the three legs and the ends of the two I-beams, which are 5-in. high and 30 ft. long. These I-beams are trussed on the under side with ⅞-in. rods. The trolley has four wheels, 12 in. in diameter, and axles 1½ in. in diameter. A Y-shape hanger is suspended from the trolley and between the I-beams; it is made of 1¼-in. x 4½-in. iron. The air cylinder is 10 in. in diameter and has a 5 ft. stroke. The wheels are stored on a number of parallel tracks, which run at right angles to the yard track over which the wheels are brought to storage. A 20-in. gage track runs from the machine shop, through the center of the storage yard and parallel to the yard track. This divides the storage space into two parts, one of which is used for receiving and the other for shipping wheels. The wheels are taken from the receiving side of the storage yard to the machine shop and are returned to the shipping side of the storage tracks on the small truck shown. With this hoist two men can load or unload a car of from 14 to 18 pairs of wheels in from 15 to 20 min.—*K. J. Lamcool and J. S. Nacry, Jr., Special Apprentices, Chicago, Indiana & Louisville, Lafayette, Ind.*

#### WHEEL HOIST.

A convenient hoist for loading and unloading wheels from cars is shown in Figs. 623 and 624. As many as 16 wheels may be placed on the platform of the hoist at one time. By admitting air to an 18-in. cylinder placed in the pit underneath the platform it may quickly be raised to a level with the floor of a flat or box car. To guard against accident, due to a sudden fall in the air pressure or other cause, the two hooks which are shown attached to the uprights are slipped under iron rods at

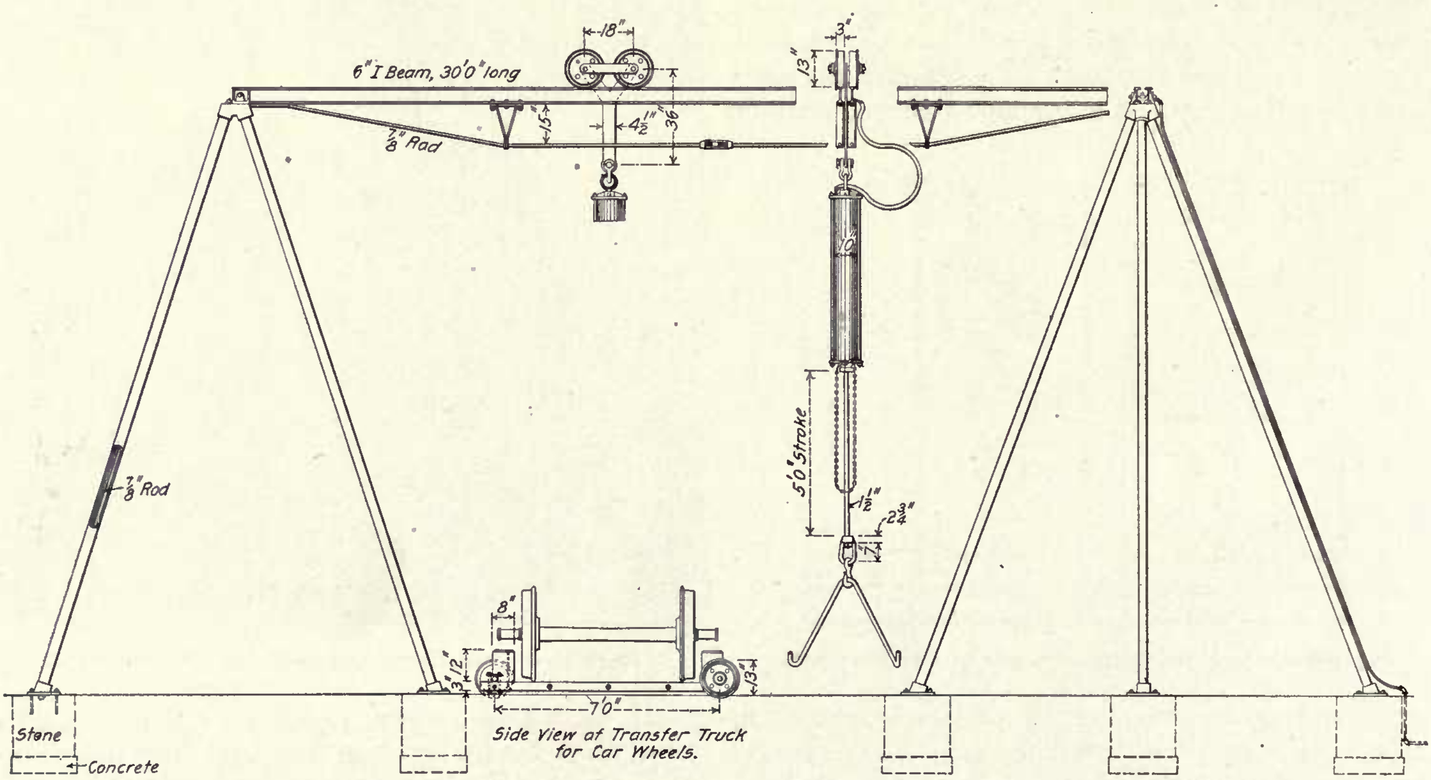



Fig. 622—Hoist for Loading and Unloading Mounted Car Wheels.

the top of the side walls of the platform. The platform is 6 ft. wide between the sides and 8 ft. long. To steady it, braces or brackets are attached to the under side and bear against the uprights, the sides of which are covered with steel plates. There are three of these brackets to each upright, and there are also smaller brackets at about the middle of each end of the pit, these latter brackets bearing against plates which are attached to the walls of the pit. The uprights or columns are of timber, about 7 in. x 7 in. in section. A portable loading platform extends from the car to the hoist. The air cylinder is constructed of two 18-in. cylinders, one on top of the other, and connected to form a single cylinder. These were at one time used on portable air jacks for raising loaded freight cars or passenger cars, but proved to be too heavy and bulky to be used advantageously for that purpose.—*Erie Railroad, Buffalo, N. Y.*

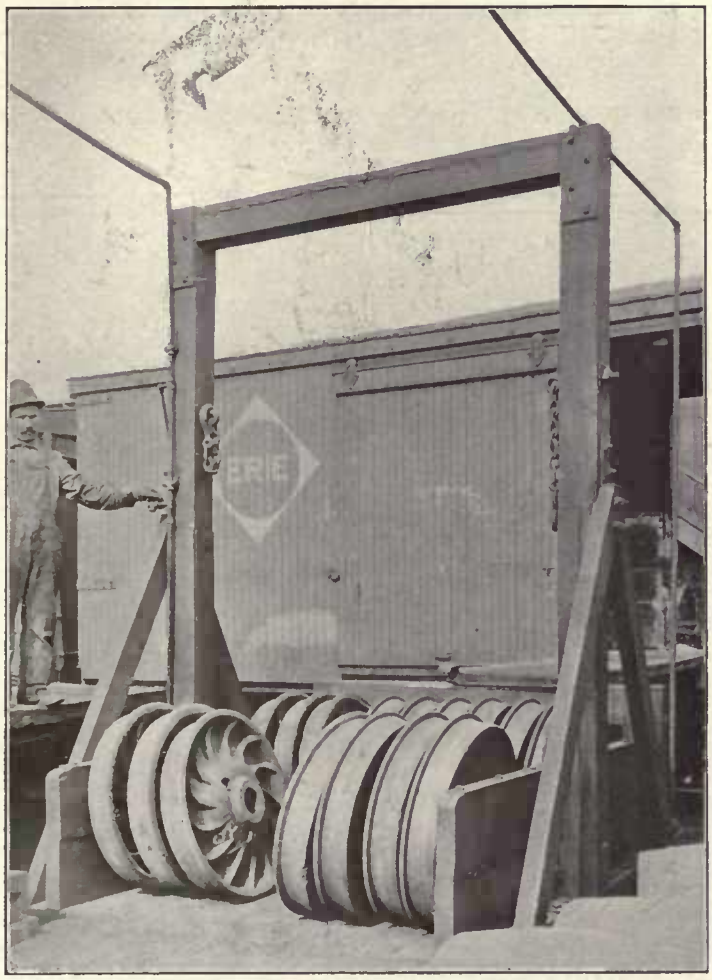



**Fig. 623—Sixteen Car Wheels on Hoist Ready to Be Raised.**

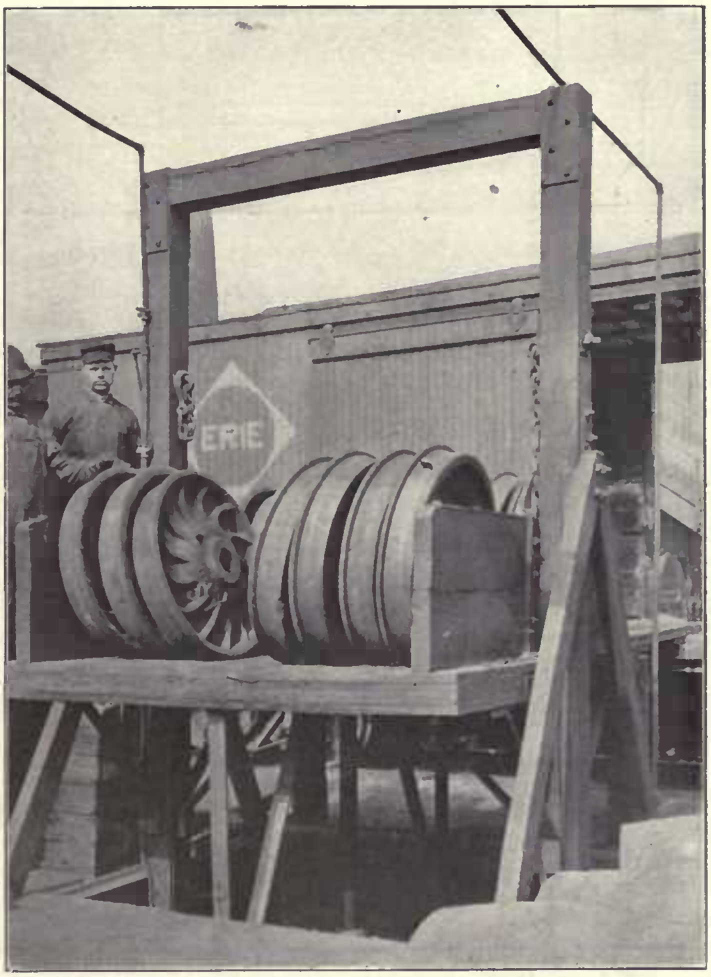



**Fig. 624—Wheel Hoist Raised to Level of Car Floor.**

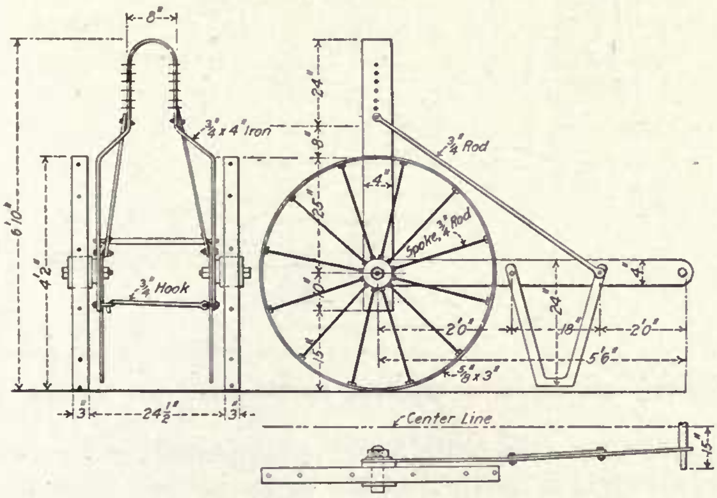



**Fig. 625—Wheel and Plate Truck.**

WHEEL AND PLATE TRUCK.

A truck for carrying car wheels or boiler plates, and arranged so that the plate may be swung between the wheels and the handle is shown in Fig. 625. The wheels are 50 in. in diameter, and the yoke over the top is high enough to take boiler sheets of moderate size.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

WHEELS, DISMOUNTING.

A scheme used in connection with a car wheel press, so that car wheels may be applied or removed without changing the heavy movable head on the press, is shown in Fig. 626. It is simple and inexpensive, and saves considerable time ordinarily required for changing the press. The bar *X* may be made of an old piston rod, and when not in use may be unhooked from the supporting chains and placed to one side out of the way. To remove the wheels from the axle, hang the bar on the chains and roll the wheels in the press so that the inside face of one wheel rests against the surface Y. The bar is hung on rollers, as shown in the drawing, so that it may easily

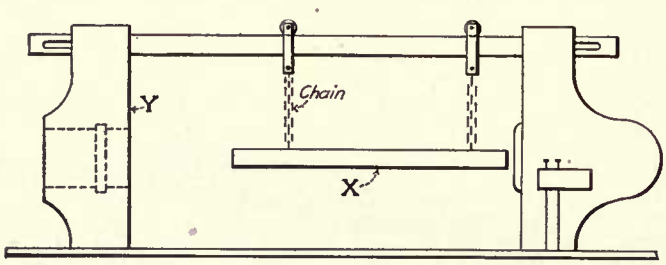



**Fig. 626—Simple Device for Removing Car Wheels.**

be moved back and forth with the plunger.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

WHEELS, LOADING MOUNTED.

An efficient device for loading car wheels is shown in Fig 627. As the hoist raises a pair of wheels, the skids move up also, and when sufficiently high the wheels roll out of the head and onto the car without any handling.

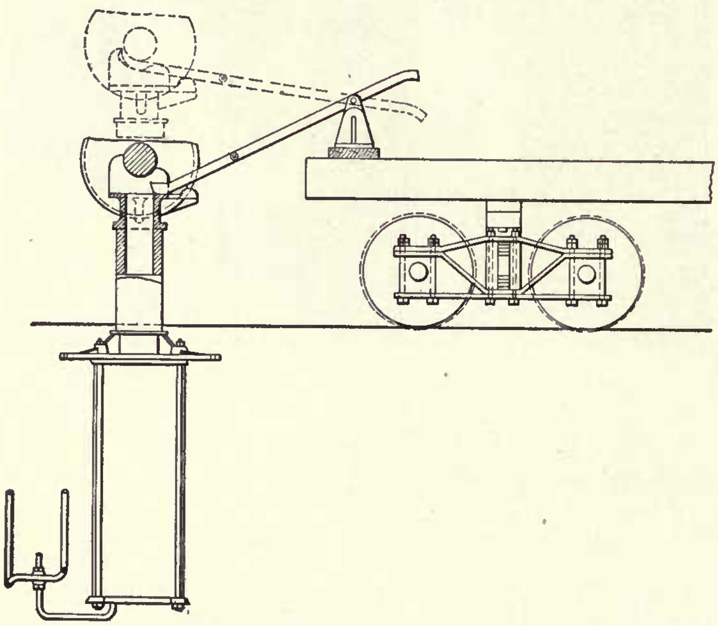


**Fig. 627—Device for Loading Mounted Car Wheels.**

By this method it is only necessary to roll the wheels in position over the hoist and apply the air.—*C. J. Drury, General Roundhouse Foreman, Atchison, Topeka & Santa Fe, Albuquerque, N. Mex.*

WHEELS, LOADING MOUNTED.

A novel method of loading and unloading car wheels to and from flat cars is shown in Fig. 628. The cylinder of the air jack has an inside diameter of 8 in., and the piston a stroke of 5 ft., or sufficient to raise the wheel to the level of the floor of a flat car. The wheel is kept in an upright position by the two pieces of 3/16 in. boiler plate through which a bolt is placed, as shown, to prevent the wheel from rolling off endwise. The piston rod is made of 5-in. pipe. The cylinder is set in a bed of concrete.—*T. E. Freeman, General Foreman, and A. G.*

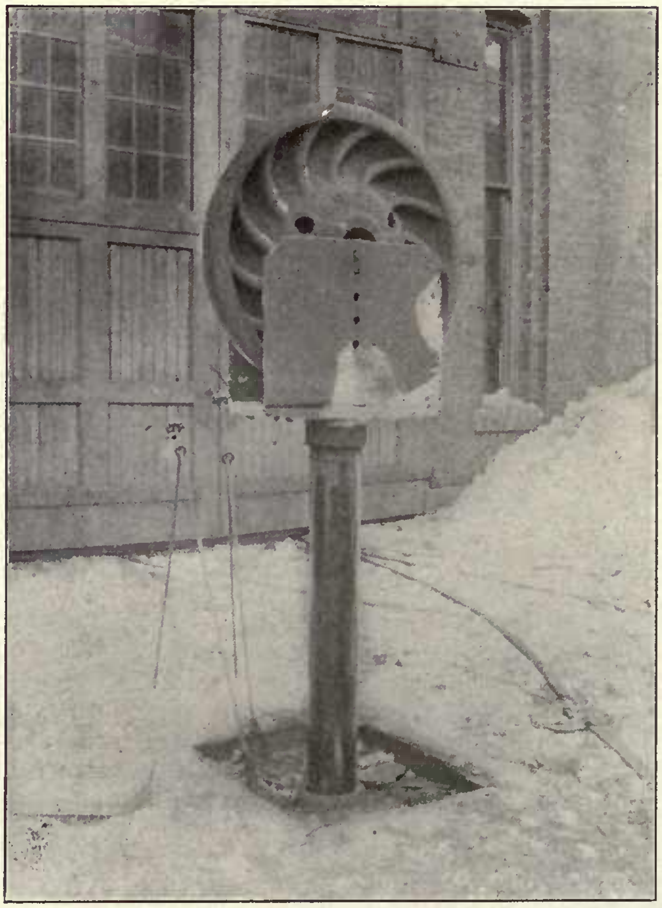


**Fig. 628—Jack for Loading Car Wheels.**

*Wright, Master Mechanic, Chicago, St. Paul, Minneapolis & Omaha, Sioux City, Iowa.*

WHEELS, TRUCK FOR MOUNTED.

A truck for moving mounted wheels is shown in Fig. 629. Two of these trucks are operated together. The

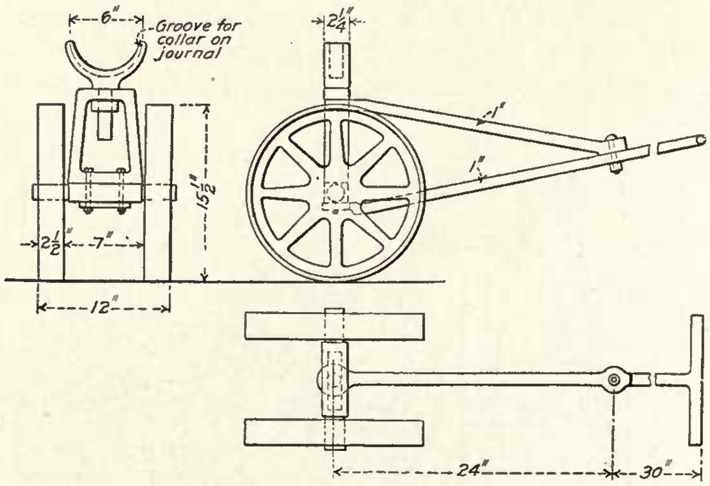



**Fig. 629—Transfer Carriage for Mounted Car Wheels.**

yoke which rests in the bracket or support above the axle is grooved to receive the collar on the journal. When the handle of the truck is raised the yoke is lowered and may be pushed underneath the journal; by bringing the handle down again the wheel is raised from the floor. By using one of these trucks at each end of the axle, wheels and axle may be transferred to any convenient place. The trucks can be run under a car or across the track to bring the wheels into proper position.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

WHEELS, TRUCK FOR MOUNTED.

A convenient cart for moving mounted wheels about the yard is shown in Fig. 630. To pick up a pair of wheels the cart is tipped over to one side enough to allow the wheels and axle to be run under it. The hook is placed under the center of the axle, and then by bearing down on the handle of the cart the front wheel is raised off the ground, the fork at the same time coming down over the axle near the rear wheel. A bolt or rod is slipped

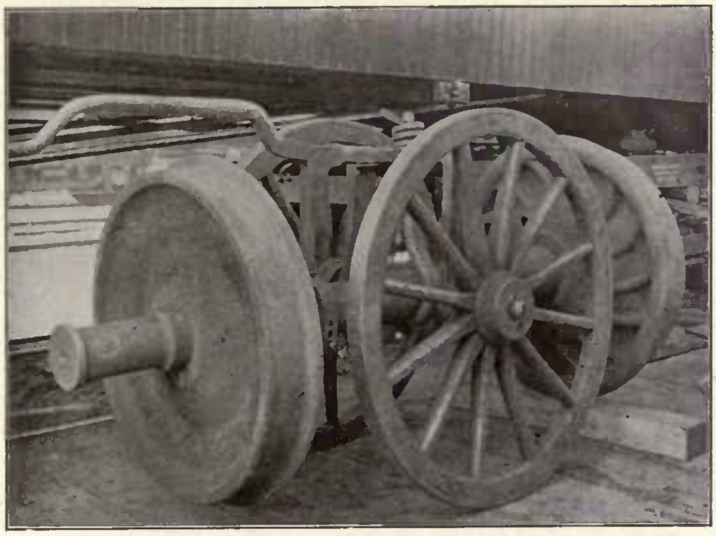


**Fig. 630—Truck for Transporting Mounted Wheels.**

through the holes in the jaws of the fork underneath the axle, and by raising the handle of the cart both wheels are lifted clear of the ground. As the axle is hung from near the center the weight may be very evenly balanced. To unload the wheels the operation as described is reversed. The wheels on the cart are 42 in. in diameter and have steel tires 2 in. wide. A spring which supports the upper end of the bolt, from which the hook that carries the axle is suspended, makes the cart ride more easily. Mounted wheels can easily be moved about the yard by its use.—*Erie Railroad, Buffalo, N. Y.*

WHEELS, TRUCK FOR MOUNTED.

A 10-in. channel forms the floor of the truck for handling mounted wheels shown in Fig. 631, the flanges of the channel projecting upward. The wheels are loaded on the truck by placing the ends of the wheel sticks over the flange of the channel and under the journal; the flanges of the channel keep the wheels from rolling off. The large wheels are 10 in. in diameter and the treads are 2 in. wide. The two small wheels at either end of the truck keep it from tipping and catching when the load is not evenly balanced. The truck has been used successfully over soft ground and on uneven floors, and, in addition to handling mounted wheels, may also be used to advantage for transporting other heavy parts.—*H. L. Burrhus, Assistant to General Foreman, Erie Railroad, Susquehanna, Pa.*

WHEELS, TRUCK FOR MOUNTED.

In most car repair yards narrow gage lorry tracks are provided between every other pair of repair tracks for the transportation of supplies and material. One of these tracks at our shop starts near the wheel storage tracks. The truck shown in Fig. 632 may be placed on the narrow gage track and a pair of wheels rolled on it; the

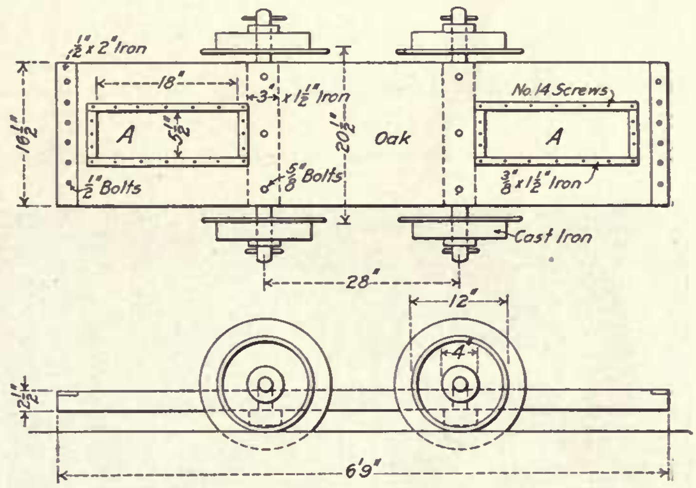



**Fig. 632—Truck for Transporting Mounted Wheels.**

wheels drop in the cavities *A*, which are 5½ in. wide, and are thus held from rolling off while the truck is moved about the yard. Mounted wheels, which are removed from the cars, may be transported about the yard in the same way.—*C. C. Leech, Foreman, Pennsylvania, Buffalo, N. Y.*

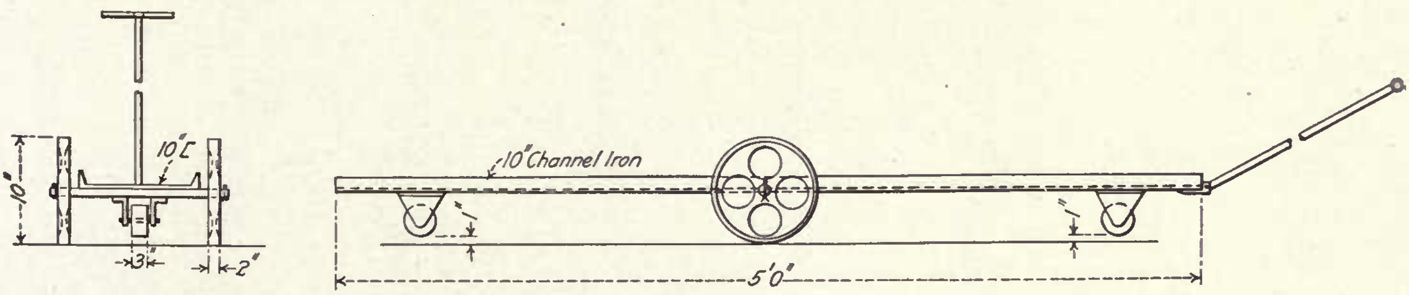



**Fig. 631—Truck for Mounted Wheels.**

### WHEELS, TRUCK FOR MOUNTED.

The advantage of the truck shown in Fig. 633 for handling heavy material, such as wheels, axles and couplers, is that it is very low and the material may easily be loaded on it. The truck will run much easier if the journals are provided with 7/16-in. roller bearings.

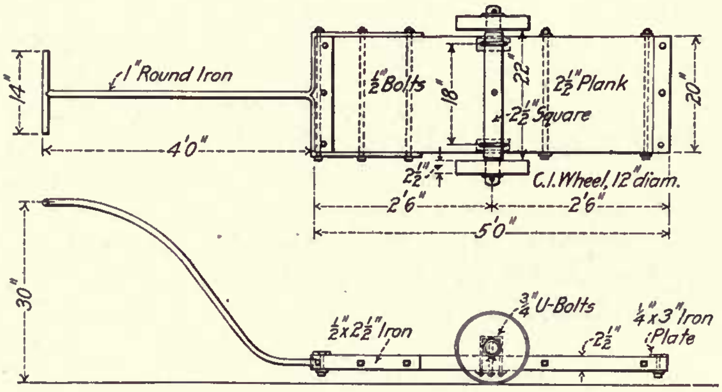



Fig. 633—Truck for Handling Heavy Material.

The floor is constructed of 2½-in. oak planks; the ¼-in. x 3-in. iron plates at the ends prevent the floor from being damaged in loading material on the truck.—*William H. Wolfgang, Draftsman, Wheeling & Lake Erie, Toledo, Ohio.*

### WHEELS, TRUCKS FOR MOUNTED.

Between each pair of standard gage tracks in the car repair yard is a lorry track. By the use of the truck shown in Fig. 634 mounted wheels may be transferred

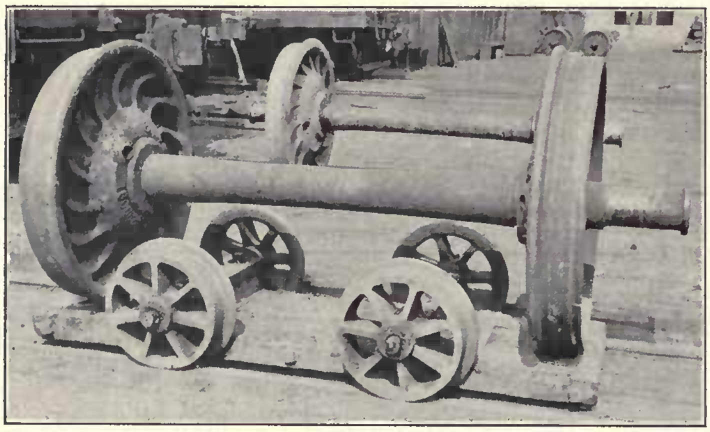


Fig. 634—Truck for Transporting Mounted Wheels on Lorry Tracks.

about the yard over these tracks. The wheels of the truck are 15 in. in diameter and the axles have 1⅝-in. journals. The body is made of two pieces of 3-in. x 10-in. plank, 5 ft. 9 in. long. That part on which the wheels run is protected by a steel plate, except for a space at the middle, which is scooped out slightly to prevent the wheels from rolling off. When these trucks cannot be used, or where it is necessary to have trucks for pulling

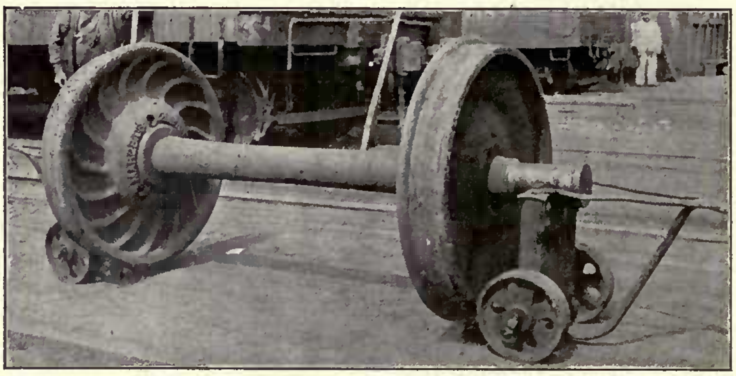


Fig. 635—Trucks for Mounted Wheels.

the mounted wheels under the car, the two small trucks, shown in Fig. 635, are used. To lift the mounted wheels it is only necessary to back these trucks underneath the journals and bear down on the truck handles. The 10-in. wheels are 3 in. wide. The 2½-in. x 12-in. wooden block, on which the journal rests, is supported on a 1-in. x 2½-in. piece of iron, which is turned at each end to provide journals. The wooden block is covered with a copper plate where it comes in contact with the journal. The truck handle is made of 1-in. iron rod. One man pulls the forward truck and another pushes the rear one. —*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

### WRENCH FOR OPERATING HOPPER DOORS.

The wrench shown in Fig. 636 is convenient for operating the winding bar for closing the hopper doors on

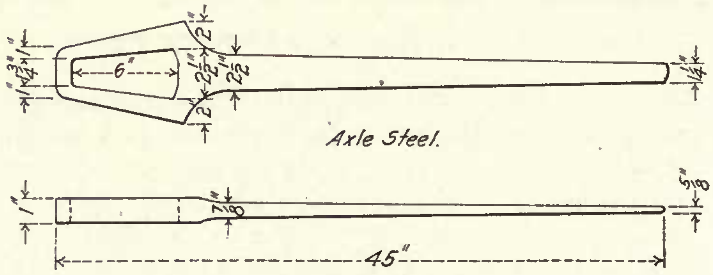



Fig. 636—Wrench for Operating Hopper Doors.

freight cars. The square ends on the winding shafts vary in size on the different classes of equipment, and such a wrench is necessary unless a number of different size wrenches are available at different points throughout the yard.—*C. C. Leech, Foreman, Pennsylvania, Buffalo, N. Y.*

# Steel Freight Car Kinks

CENTER SILLS OF STEEL TANK CARS, STRAIGHTENING.

Steel tank cars are often sent to the repair yard with about 6 in. of clearance at the truck bearings on one side of the car, while the bearings on the opposite side are tight together. This is, of course, due to twisting of the center sills because of a derailment, rolling down an embankment, rough handling by the wrecker, or all combined. Were it necessary to remove the center sills it would require holding the car out of service about a week. At Mt. Clare such a job of repair work requires only about five hours' time. The two high corners of the car are chained to the rails. The low corners are then jacked up until they are on a level with the high corners, all measurements being made at the side bearing. A wood fire is then built under the section of the center sills where the twist occurs, and when sufficiently heated the metal responds to the strain put on it by the chains and jacks. An oil burner may also be used for the heating.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

JACK FOR STEEL CAR REPAIRS.

The steel car repair jack shown in Fig. 637 has proved valuable as a time and labor saver in repairing steel cars. It is built of a number of channels, so arranged as to act as guides and supports for screw jacks which may be used on either the side or top members of the frame. The columns are spaced 7 ft. 6 in. apart; they are imbedded in concrete piers, which are 5 ft. deep, and are braced at the top by angle irons and channels. The screw jacks each consist of two bronze nuts which are clamped to the channels by bolts so that it is possible to adjust them to any height. Through these nuts is passed a steel jack screw, outside diameter 2¼ in., with two threads per inch (square threads); on the end of the jack screw is a swivel iron head. The damaged car is placed in the structure and the bulged side sheets or underframe, after being heated with a burner, may be jacked back into their proper places and held there until they cool. Eye bolts are placed at the bases of the columns so that the cars

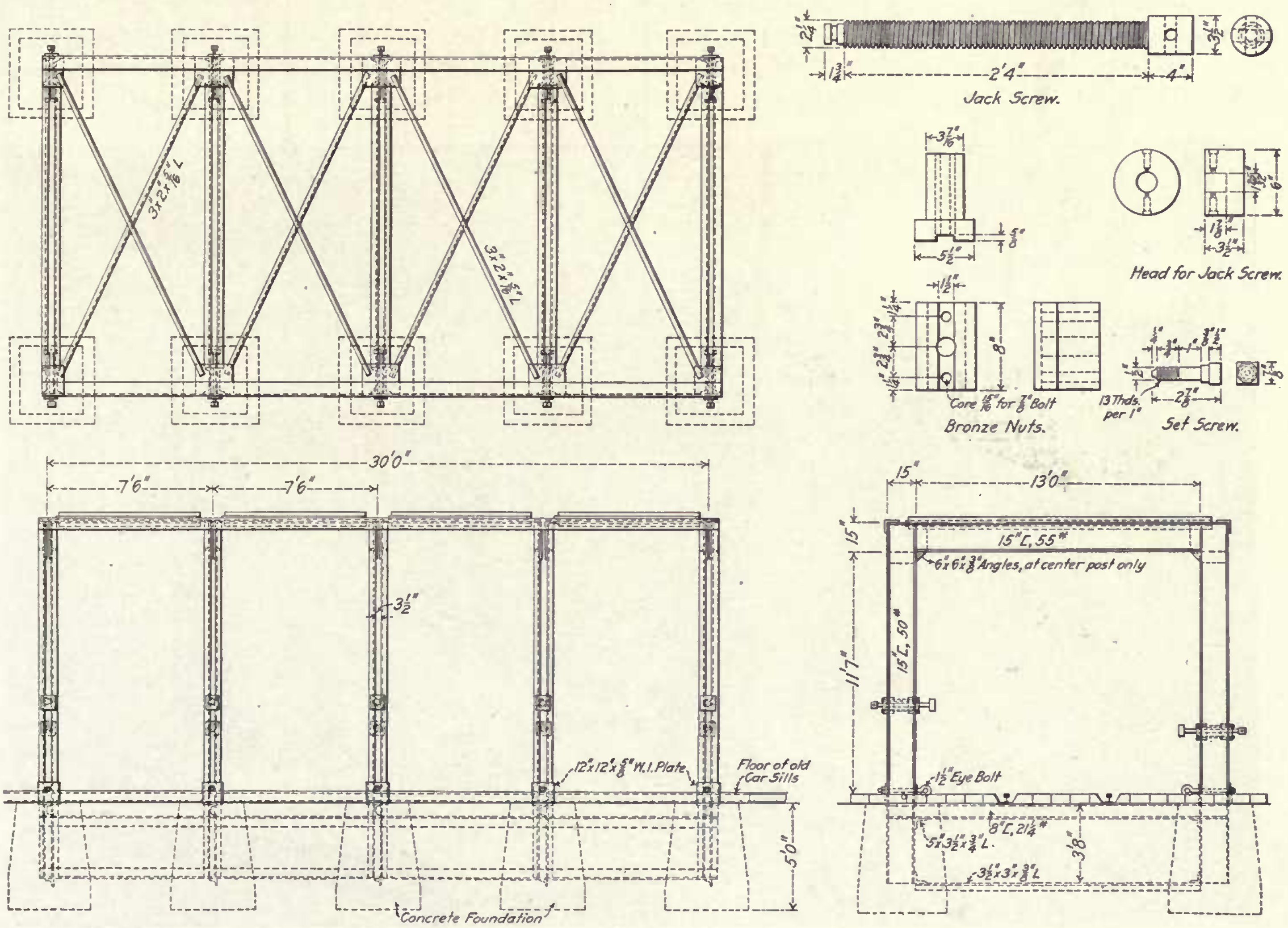



Fig. 637—Steel Car Repair Jack.

may be chained to the rail if necessary to do so.—*R. G. Bennett, Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

JACKS FOR STRAIGHTENING STEEL CAR SIDES AND TRUCKS.

The two jacks shown in Fig. 638 are available not only for use in connection with straightening trucks, but also for other work in connection with the repair of the bodies

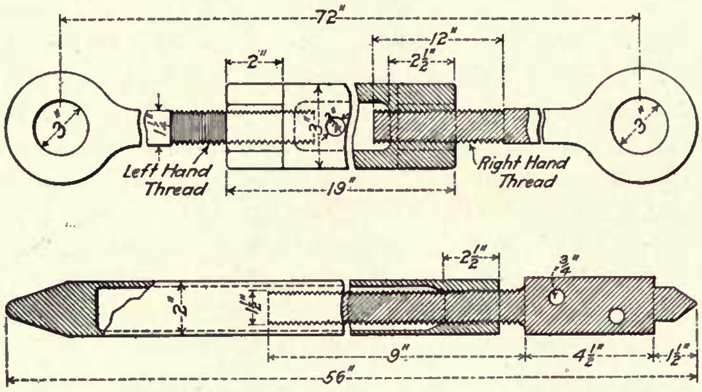



**Fig. 638—Jacks for Straightening Steel Trucks and the Bodies of Steel Freight Cars.**

of steel freight cars. The upper one is used for pulling the sides of the steel truck inward when they have been sprung out too far. The jack is so placed that the two eyes at its ends project through the truck pedestals. Bars are then placed through the eyes and the ends are pulled inward by turning the nut at the center of the jack. The lower jack is used for forcing the sides outward when they have been bent in. The construction and operation are simple, bars for turning the screw being used in the ¾-in. holes in the head at the right hand end.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

PRESS FOR STRAIGHTENING DAMAGED PARTS.

At one end of that portion of the yard which is used for repairing steel cars is a large oil furnace for heating the damaged parts, and an iron face plate and press for straightening them. This is shown in Fig. 639. The furnace was furnished by the Railway Materials Company, and is 8 ft. 10 in. wide, 20 in. high and 13 ft. 11 in. deep inside. It has an opening at the far end 15 in. high and 45 in. wide, making it possible to pass the end of a long sill or other piece of material through the furnace, so that it may be heated in the middle or at any other part. One of the burners is purposely lowered for heating parts locally. The house or hood was built over the furnace to protect it from the weather. Crude oil for use in the furnace and for the furnaces in the blacksmith shop is stored in two 6,000-gal. tanks, which are placed in a pit below the ground level. This is covered over with timbers. The oil is unloaded into these tanks from the cars by gravity and is forced from them to the furnaces by admitting air to the tanks under a pressure of 15 lbs. per sq. in.

The iron face plate on which the parts are straightened is 7 ft. wide, 10 ft. long and 6 in. thick. Most of the parts are straightened, after they are properly heated, by

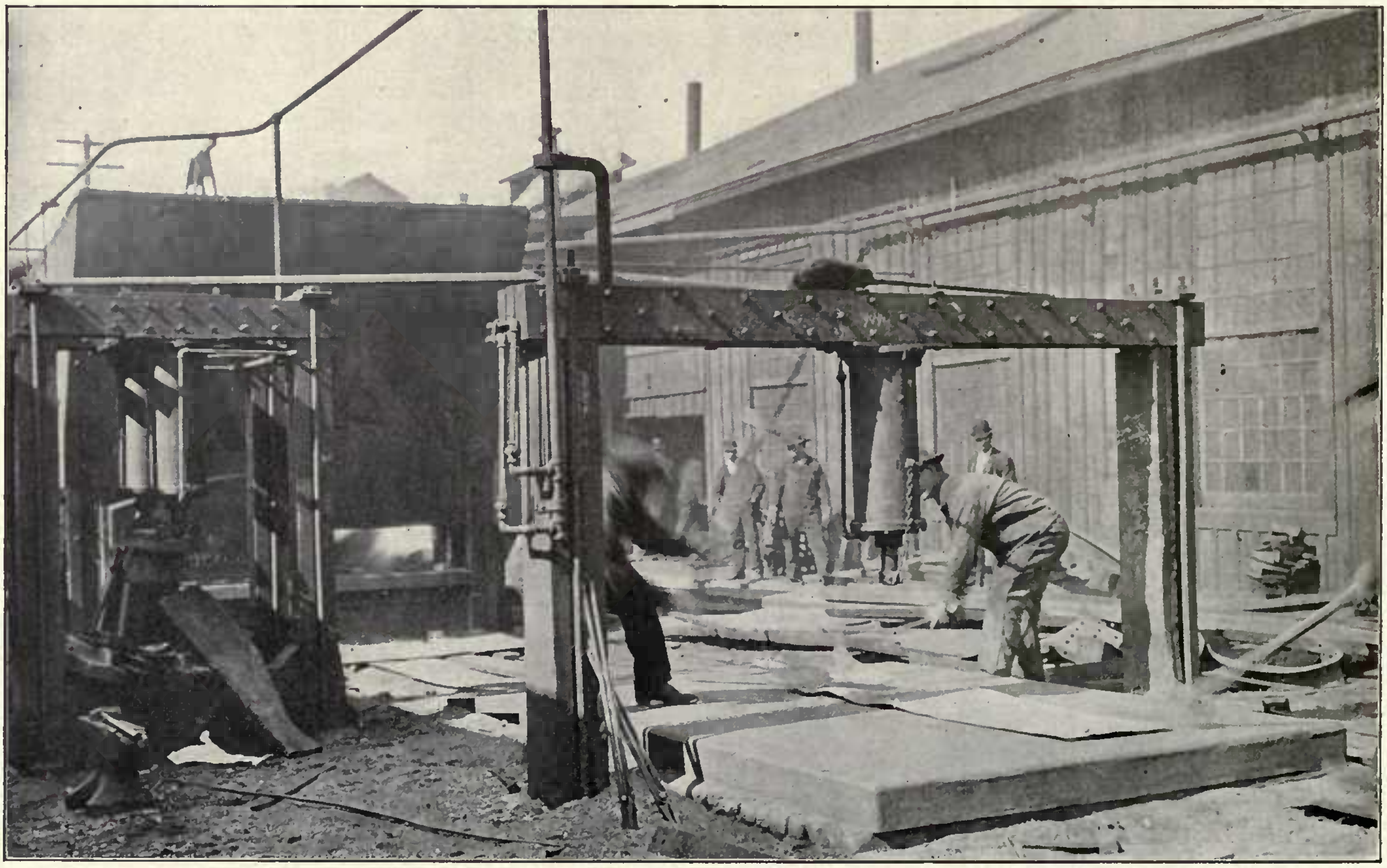


**Fig. 639—Furnace and Face Plate for Heating and Straightening Large Steel Car Parts.**

two or three men using sledge hammers. In some instances it is quicker to admit air to the cylinder, which is supported by the frame work, and clamp down one end of the piece on the face plate while the men drive down and straighten the other end. The air cylinder is about 8 in. in diameter. To the left in Fig. 639 is shown another press having two 8-in. air cylinders, which are controlled by one valve and operate simultaneously. This was intended for pressing out such parts as side stakes, using special dies. There is not much of this work to be done, however, and it is only used occasionally—*Erie Railroad, Buffalo, N. Y.*

PRESS FOR STRAIGHTENING DAMAGED PARTS.

The press shown in the drawing, Fig. 640, and in the photograph, Fig. 641, has been in use in the Columbus crums. Steel rails, up to 90-lb. sections, may be broken into guard rail lengths by a single stroke of the piston. The frame of the press is made of four 80-lb. rails, there being two rails to each half. These halves are bolted together with steel tie plates. The two parts of the frame are spaced 4 in. apart with blocks and are held together with through bolts. The face plate is made of cast iron, and is 96 in. long, 60 in. wide and 10 in. thick. This plate rests on top of the lower section of the frame, to which it is securely bolted. The top corners of the frame are stayed to the face plate by 1¼-in. rods, supplied with turnbuckles. A guide, made of 80-lb. rails, is placed about midway up the frame, and also acts as a brace. It guides the piston rod, steel pins being placed to hold the rod in any desired position.

The cylinder is made of steel tubing, 20 in. in diameter,

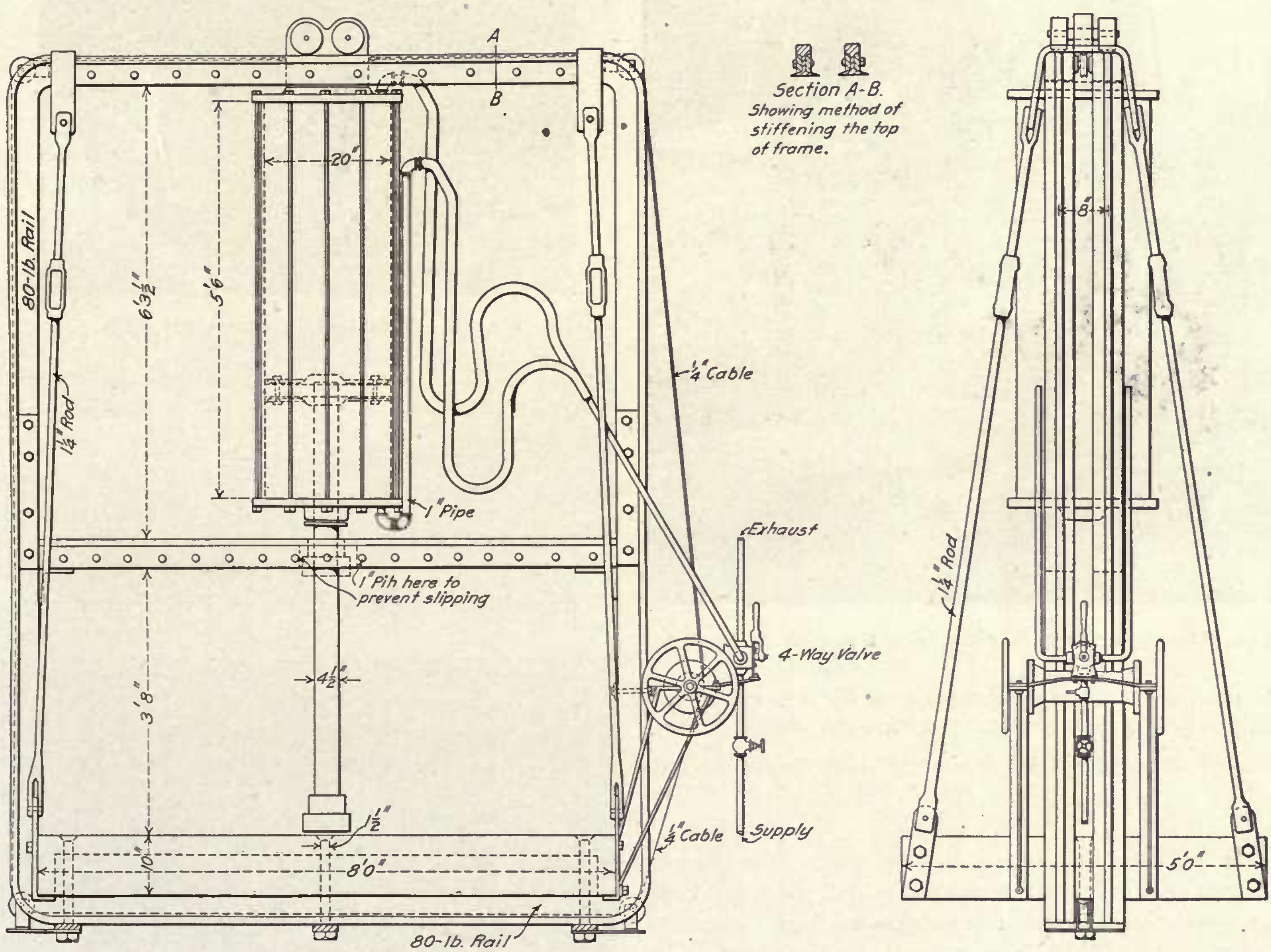



Fig. 640—Air Press for Straightening Damaged Parts and Forming New Material.

shops for several years. It is used continually by all departments of the shop in straightening damaged material and for forming new work. All steel car parts, with the exception of the center sills, are handled cold; the center sills, when badly damaged, are heated in a furnace near the press. The press is useful for straightening metal brake-beams, the dies used in this connection being made to do the work without removing the heads or ful- and is carried by four rollers which run on the top rails of the frame. It is moved across the frame by a wire cable, operated by a hand wheel. The end of the piston rod is made for attaching different shaped dies or shoes. From 90 to 100 lbs. of air is sufficient for most all classes of work, but on several occasions it has been run up to 140 lbs. without damage to the press. The press has made possible the repair of badly damaged steel-car material which would otherwise be scrapped, and has reduced the cost of repairs to these cars by 50 per cent. Bent couplers, body bolsters, truck bolsters and truck sides are easily straightened under the press and used again. Two men recently straightened 150 brake-beams in eight

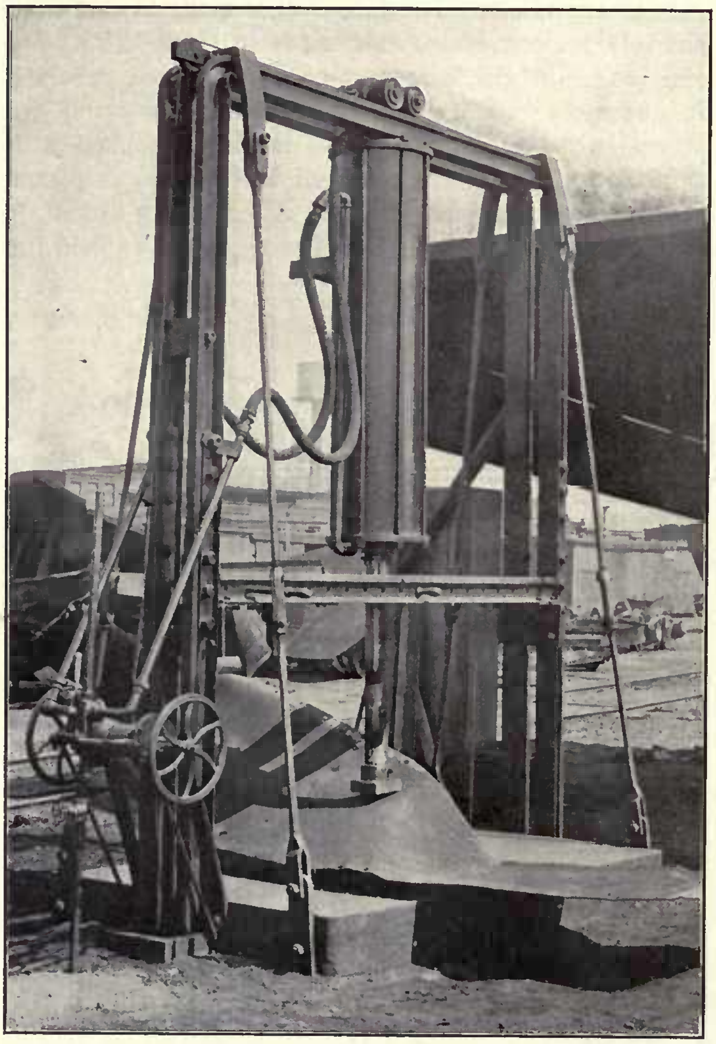


**Fig. 641—Air Press Straightening a Damaged Steel Plate.**

hours, the work including cutting off the damaged heads and fulcrums.—*E. G. Gross, Master Mechanic, Central of Georgia, Columbus, Ga.*

PULL-IN CLAMPS.

In repairing and reinforcing the sides of gondola or hopper cars it is often necessary to pull them in to the proper position. To do this a clamp has been made with a turnbuckle, 28 in. long over all, at the center. The 1¾-in. rods which fit in the turnbuckle are upset at their outer ends to form a hook, 4 in. wide and 1¼ in. thick in section which fits over the top of the sides.—*Erie Railroad, Buffalo, N. Y.*

PUNCH FOR LIGHT WORK.

It is often necessary to drill a ⅝-in. or ¾-in. hole in steel plates on trucks or car bodies when an air drill is not available or too much time would be required for setting it up. In such cases the small punch shown in Fig. 642 is of value. It will punch ⅝-in. or ¾-in. holes in plates up to ⅜ in. or ½ in. in thickness. The jaw

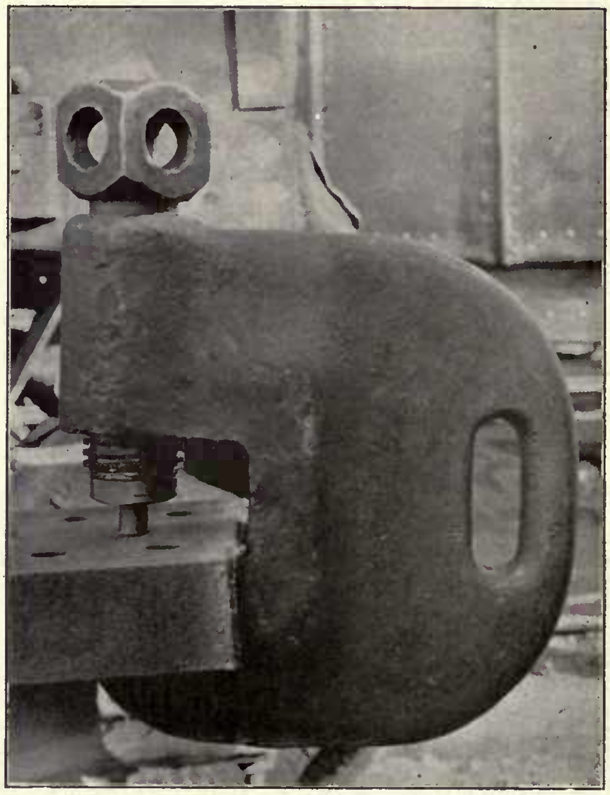


**Fig. 642—Portable Punch for Light Work.**

opening is 2¾ in. wide, and the reach from the center of the punch is 2⅝ in. The screw is 2¼ in. in diameter.—*Erie Railroad, Buffalo, N. Y.*

RIVET HEATING FURNACE.

The portable furnace for heating rivets shown in Fig. 643 is simple in construction and economical in the use of compressed air. The latter point is quite important for, as


**Fig. 643—Portable Furnace for Heating Rivets.**

a general rule, too little attention is paid to the way in which compressed air is used about a shop or a repair yard, and a large amount of it is wasted. A 2-in. pipe, about 10 in. long with a funnel at its lower end 4 in. in diameter and 4 in. long, is screwed into the bottom of the fire pot. The 3/8-in. air pipe is clamped so that it discharges through a 3/16-in. nozzle in the end of the pipe directly up through the center of the funnel, the top of the pipe being about on a level with the lower part of the funnel. With this arrangement a suction is set up and air from the outside is drawn up through the fire. It is possible to heat the rivets as fast as they can be driven in the car, with the air valve open only one-quarter of a turn. The method of connecting the compressed air line to the furnace is also of interest. The hose *A*, which is connected to the air line, discharges through the end of the *T* to the hose B, which is connected to the air hammer, while the other connection from the *T* carries air to the blast pipe. In this way it is possible to operate the forge and the hammer from one air connection, doing away with the use of a second piece of hose.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

RIVET HEATING FURNACE.

The portable rivet heating furnace (Fig. 644) is somewhat more elaborate than the home-made heaters

Fig. 644—Portable Rivet Heater.

ordinarily used for this work on most roads. The top is 26 in. x 26 in. in size and the 3/16-in. sheet on the three sides is 13½ in. high. The wheels are 16 in. in diameter and the handles are constructed of 1-in. pipe. Draft is provided by coupling to the compressed air line.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

SAND BLAST MACHINE.

A sand blast machine, mounted on a low four-wheel truck not shown in the drawing, is illustrated in Fig. 645. This machine has been in use for two years and has

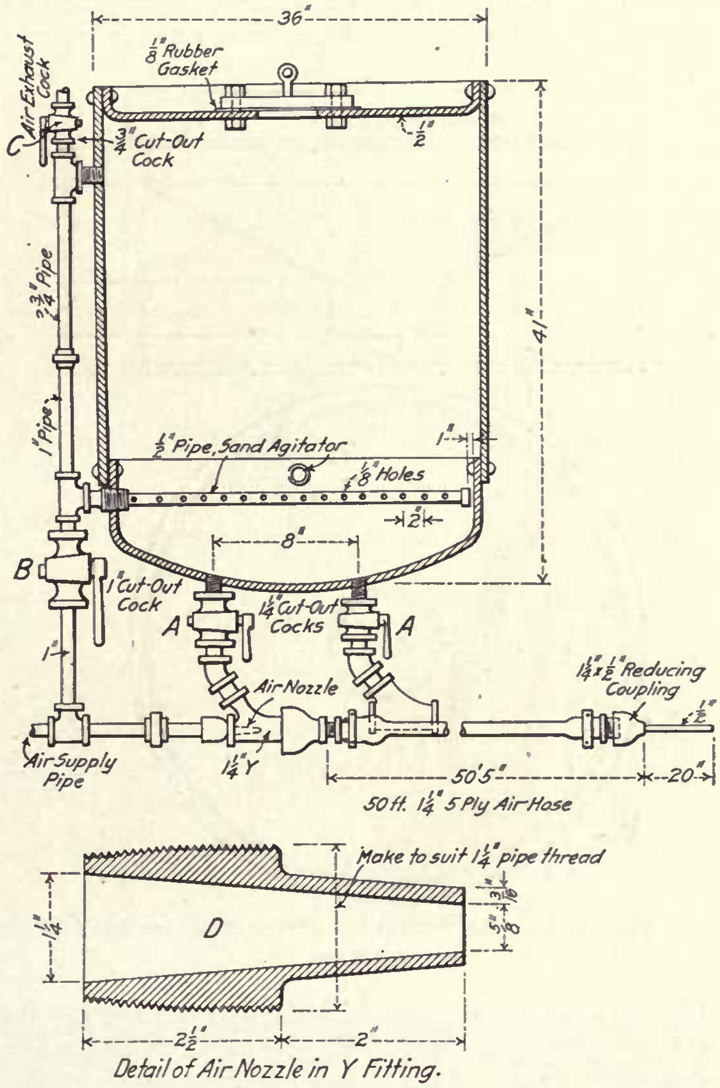



**Fig. 645—Sand Blast Machine for Cleaning Steel Cars and Locomotive Tenders.**

sand blasted about 1,600 steel coal cars and 100 engine tenders. Two laborers can sand blast a steel car complete in less than half an hour. The machine is operated by compressed air at from 80 to 90 lbs. pressure. The 1¼-in. cut-out cocks *A* regulate the flow of sand from the machine. The cock *B* is always open while the machine is in operation. The ¾-in. cut-out cock *C* releases the air pressure from the tank when the work of sand blasting is discontinued, or when it is desired to refill the tank with sand. In order to agitate the sand so that it will flow freely into the two outlet pipes, air is forced into the tank through the two ½-in. pipes near the bottom, which have ⅛-in. holes drilled in them. Unless this provision is made all of the sand will not flow out of the tank, particularly if it is at all damp. Air also enters the tank through the ¾-in. T just below the cock *C*. It also flows through the nozzle *D* in the 1¼ in. Y and joins the flow of sand from the tank, thus forming a partial vacuum in the Y fittings, causing the sand to flow uniformly in the proper quantity, and at a velocity that will give the most efficient results. Hard crystal ore sand gives the best results, although any sharp sand of medium fineness may be used. We have used the same sand several times, but find that it does not cut well after the third time. After it is useless for air blast purposes, it may still be used to advantage on locomotives. The screen shown in

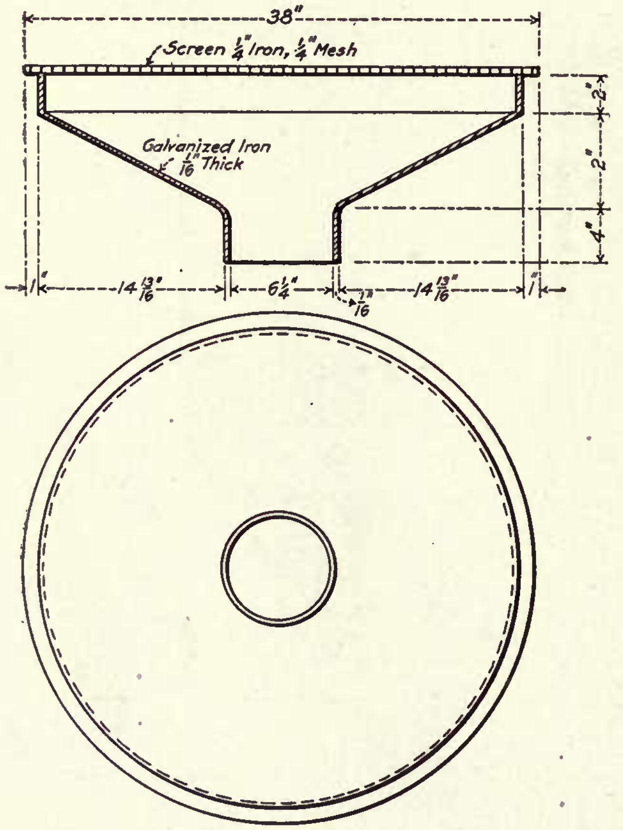



**Fig. 646—Screen and Funnel for Filling Tank of Sand Blast Machine.**

Fig. 646 is used when it is desired to use the sand a second or third time. It will pass through the screen and funnel into the tank as fast as two men can shovel it.

The track used for this work should be so arranged that the cars or engine tenders to be sand blasted will run to and from the sand blast machine by gravity, thus making the use of a special engine to shift the cars unnecessary, or doing away with the slow method of pushing the cars with pinch bars. In order that no time may be lost in refilling the tank of the sand blast machine, an old box car has been rebuilt and is used as a sand storage car. It is filled with sand at the sand house by means of two drop doors in the roof of the car. Two pockets or hoppers are provided in the car, each holding about 10 tons of sand. Two small sliding doors are placed on one side of the car, through which the sand may be run directly into the tank of the sand blast machine. To open or close the inlet to the tank, it is necessary to remove or replace six 1-in. nuts and the cover plate. As there are two separate sets of air inlet and air and sand outlet pipes, which are independent of each other, two men may sand blast different parts of the car at the same time, which is an important advantage.

Before the sand blast was used for removing the rust and old paint from cars and tenders, we used steel brushes, scrapers, revolving steel brushes operated by air motors, and other devices, but with very little success. They do the work only half as well and require twice the time. The most important places to be scraped and cleaned, which are around the rivet heads and at the angles and joints, could not be cleaned at all, or not very well, with these devices. The sand blast machine is simple to operate and cleans the steel around the rivet heads and in the joints and corners thoroughly. Two men can work on the car at the same time, one on each side. Because of the agitator in the tank, damp or partly wet sand will not interfere with the working of the apparatus. The supply of sand to the hose is uniform and there is no waste of either sand or air. The machine is also used to advantage for sand blasting the brass trimmings of passenger cars, these parts thus being given the appearance of statuary bronze or old gold.—*Frank J. Borer, Foreman Air Brake Department, Central Railroad of New Jersey, Elizabethport, N. J.*

TORCH FOR HEATING DAMAGED PARTS.

It is quite often possible to straighten or repair damaged parts of steel cars in place. For this purpose a

**Fig. 647—Heating a Steel Center Sill with Crude Oil Burner.**

Ferguson portable heater and kindler is used. The flame from such a burner playing on the center sill of a steel underframe is shown in Fig. 647. Where it is necessary to heat the bottom of a member of a steel underframe on a wooden car the oil burner cannot be used, because of the danger of igniting the wood. For such purposes a small size open top rivet heating forge may be used to advantage.—*Erie Railroad, Buffalo, N. Y.*

TOOL BOX, PORTABLE.

The men engaged in steel car repair work keep their tools in special portable tool boxes, as shown in Fig. 648. They are constructed of heavy galvanized iron, the box or house measuring 33½ in. in length, 2 ft. in width and 2 ft. in height. The door opening is 14 in. square, the door

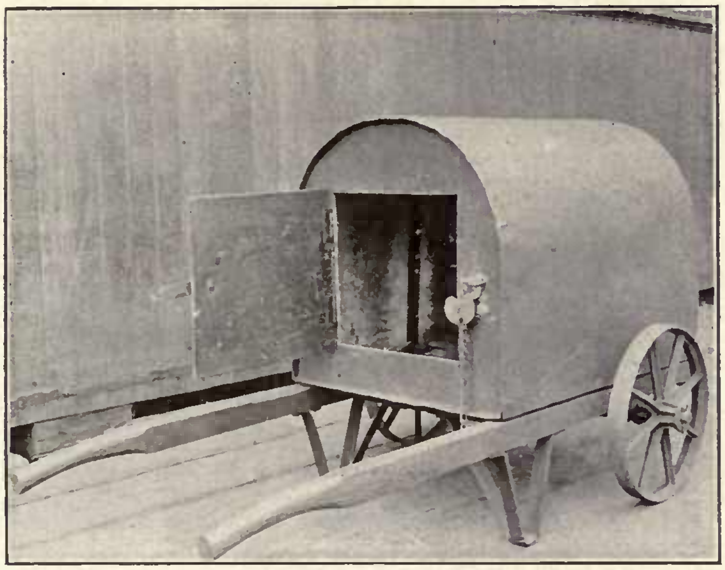


**Fig. 648—Portable Tool Box for Steel Car Repair Gang.**

being secured by a padlock when the box is not in use. The wheels are 16 in. in diameter. The tools include cold chisels, sledge and hammer, drifts and wrenches; also pneumatic hammers, etc.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

TORCH FOR HEATING DAMAGED PARTS.

A simple and convenient crude oil burner is shown in Fig. 649. The oil tank is made from a 16-in. x 33-in.

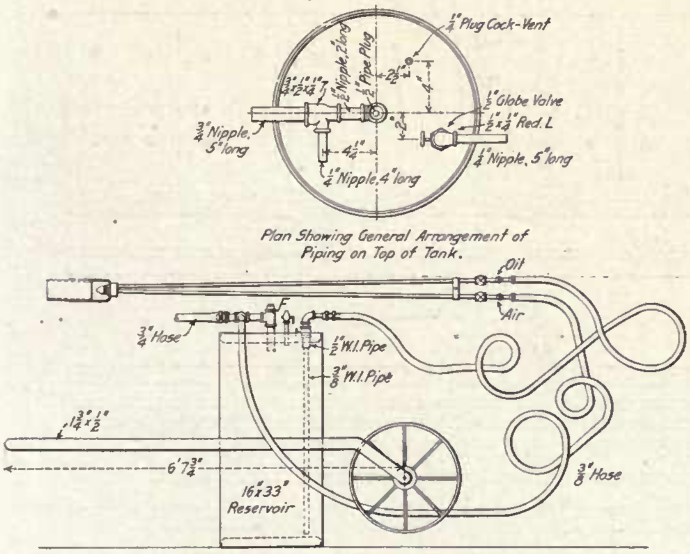



**Fig. 649—Portable Crude Oil Heater.**

air reservoir. Air is admitted to the tank through the connection at F, the pressure forcing the oil out through the ⅜-in. pipe and hose. The construction of the burner is clearly shown in Fig. 650. The supply of oil and air to the burner is controlled by the globe valves. The oil tank

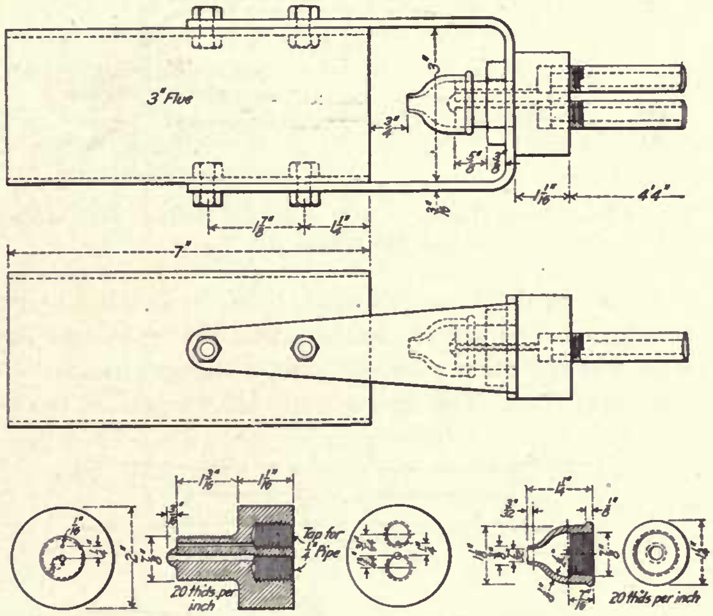


**Fig. 650—Torch on Crude Oil Heater.**

may be refilled by removing the plug at F. Air pressure is used at from 75 to 100 lbs. per sq. in. The handles of the truck are made of ½-in. x. 1¾-in. wrought iron, and are tied to each other by two ⅜-in. bolts on either side of the tank, the arms being properly spaced apart by 6-in. lengths of pipe through which the bolts pass.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

TORCH FOR HEATING DAMAGED PARTS.

A crude oil burner for heating damaged parts on steel underframe or all-steel cars is shown in Figs. 651, 652

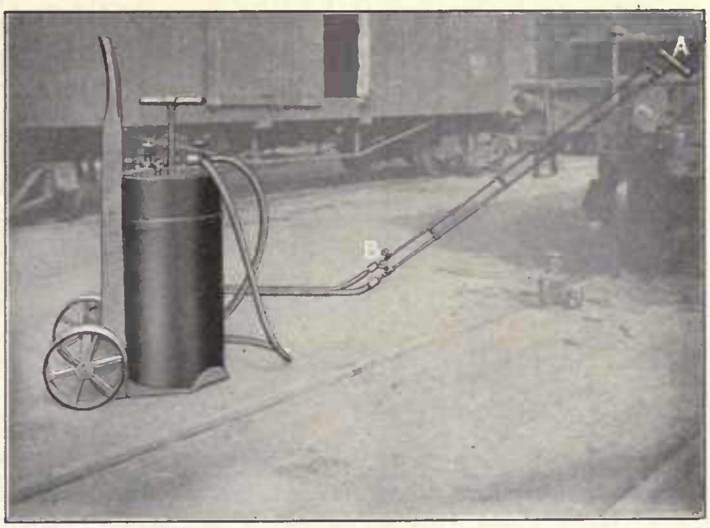



**Fig. 651—Crude Oil Torch for Heating Damaged Parts of Steel Underframe or All-Steel Cars.**

and 653. The end of the torch (Fig 653) may be made in any shape or length required for properly directing the flame on the different parts of the underframe of the car. This end is screwed on the short piece of 1¼-in. pipe which fits on the end of that part of the burner which

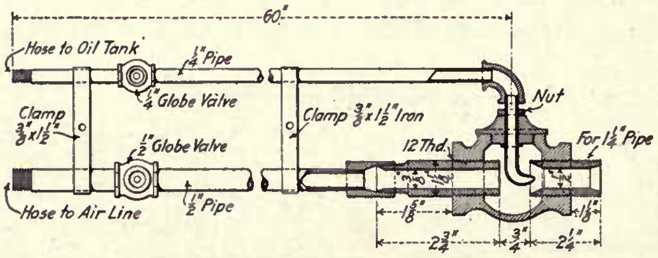



**Fig. 652—Arrangement of Air and Oil Pipes and Mixing Chamber for Crude Oil Torch.**

is shown in detail in Fig. 652. The end shown in the photograph is used for heating two center sills at one time, this operation requiring only a comparatively short amount of time. The burner is regulated by the two globe

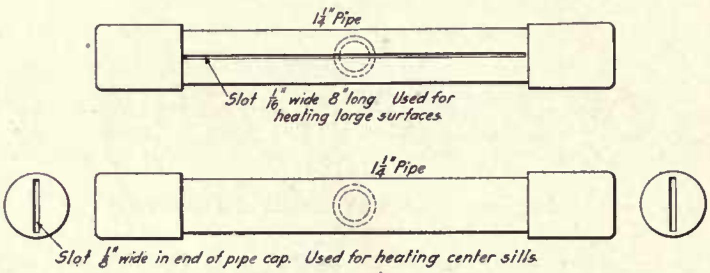



**Fig. 653—Typical End Pieces or Burners for Crude Oil Torch.**

valves at B, one of which controls the compressed air and the other the oil. The oil reservoir is mounted on a two-wheel truck, so that it may easily be handled about the yard and over the tracks. The hose from the compressed air line is connected just back of the globe valve at the rear of the top of the tank, and air is admitted to the tank. This pressure forces the oil out through a pipe, which extends to within 1½ in. of the bottom of the tank, and through the hose to the burner. Air is also forced through the other hose to the burner. The cheapest grade of crude oil is used, cutting the cost down to one-half of what it formerly was with a kerosene burner.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

UNDERFRAMES, STRAIGHTENING.

A table designed for repairing steel cars, especially the underframes, is shown in Figs. 654 and 655. This work

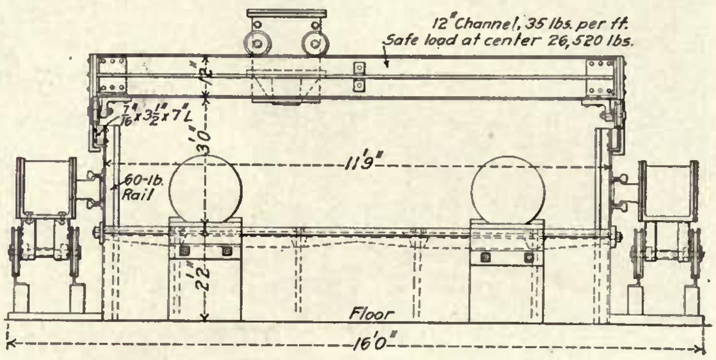



**Fig. 654—Elevation of Steel Car Repair Table.**

is coming to require more and more attention, as the number of steel cars in use is rapidly increasing. The table is substantially built on a concrete foundation, reinforced with rails held in place by a number of anchor

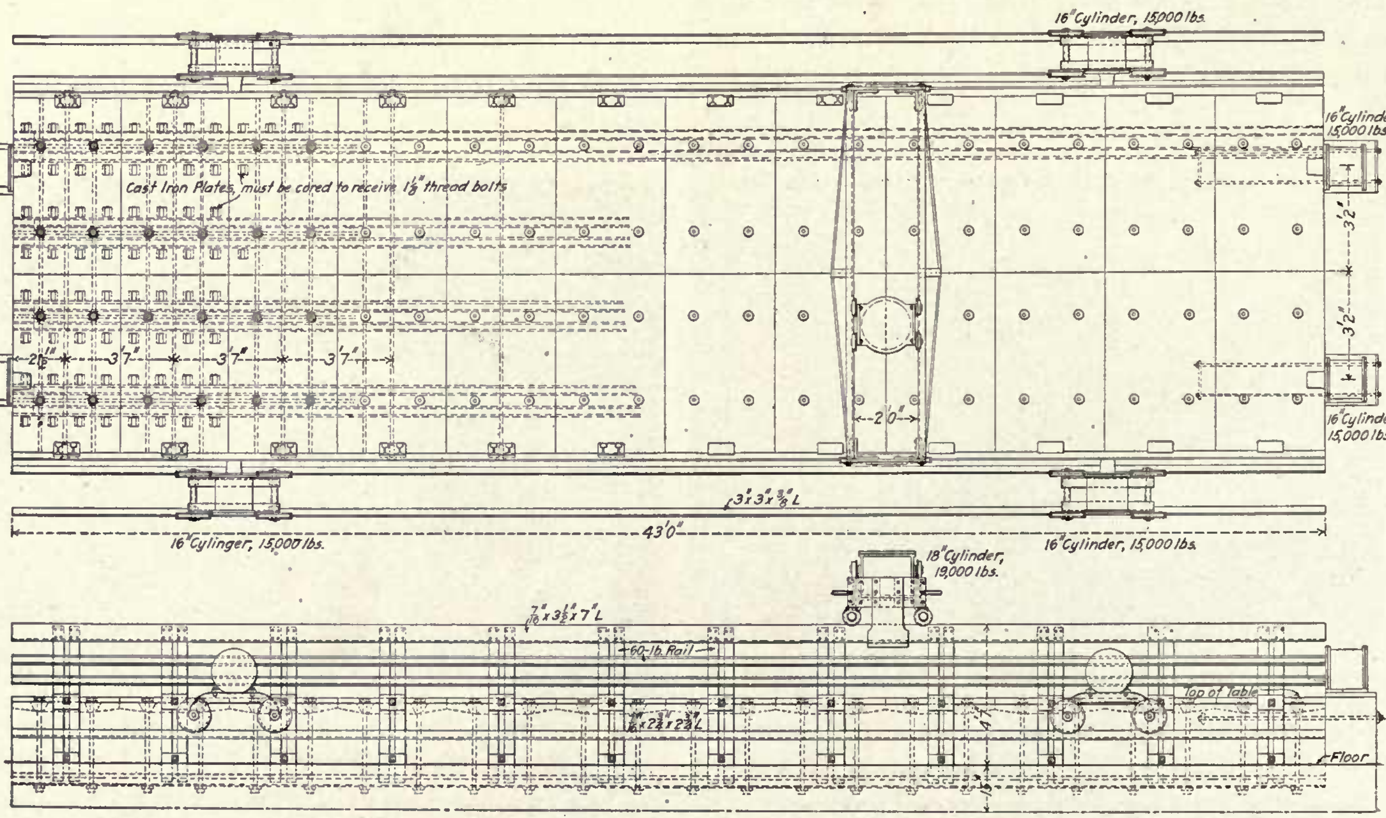



**Fig. 655—Plan of Steel Car Repair Table.**

bolts. The top surface is composed of sectional plates, which form a face plate. A number of T-slots for holding down the work are provided. There are two movable cylinders on each side of the table, which may be placed in any position to exert side pressure. The end cylinders are stationary for exerting pressure on the opposite corners in case of the frame being out of square. An 18-in. cylinder overhead, having a capacity of 19,000 lbs. pressure, can be moved in any position over the face plate, its carriage traveling lengthwise of the table, while the cylinder itself travels across the carriage. With this cylinder ordinary bends may be straightened cold. In case of sharp kinks in the frame it is heated before applying the pressure. This table is a new departure in these shops and is found to be very valuable in taking care of steel car work.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

UNDERFRAMES, STRAIGHTENING.

A car had been in a fire and had lost its entire wood superstructure. When it arrived at the shops it was found that the underframe had drooped considerably. To dismantle the frame for individual straightening of the members would have taken about six days. The frame was turned upside down and rested on three rails, placed at the ends and in the middle, across and a few inches above the track. A wood fire was then built under the drooped section of the frame, and when heated sufficiently it became straight, due to the action of its own weight. This same method has been used with frames which would not straighten of their own weight, in which case it was only necessary to lift the frame by both ends and allow it to fall on the rails, which later acted as a faceplate. An underframe may be straightened in this way, using six men including crane hands, in about ten hours, at a cost of a little more than 10 per cent. of what it would cost to take it apart, straighten the individual members separately and reassemble the frame. The repairing of steel freight cars is not a difficult matter; it requires only a comparatively few special tools, and the wooden car repairmen soon become accustomed to it.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

# Passenger Car Kinks

CARPET CLEANER.

A simple arrangement for cleaning carpets with compressed air is shown in Fig. 657. The carpet is first rolled on a wooden roller, which is hung in the brackets *A*. One end is then carried up over the rollers and underneath the air pipe *B*, which has a 1/16-in. slot on its underside where it comes in contact with the carpet. The air blows the dirt out of the carpet, which is slowly moved along until the end can be made fast to the roller *C*. The remainder of the carpet is then drawn slowly through the machine by revolving the roller *C* by the hand wheel at the side of the machine. When the carpet has been wound on the roller *C* it may be removed by lifting the hinge *E* on the frame. The frame is constructed of wood.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

BRAKE HEADS, APPLYING.

Diamond Special brake beams have heads arranged as shown in Fig. 656. The head is held to the beam by a cast lug, which is forced into a recess in the beam by a strong spring. The position of the lug when the head and beam are locked is shown by the dot and dash line on the sketch. The usual method of releasing the spring *S* is to turn the nut *N* a distance of about 1¼ in. along

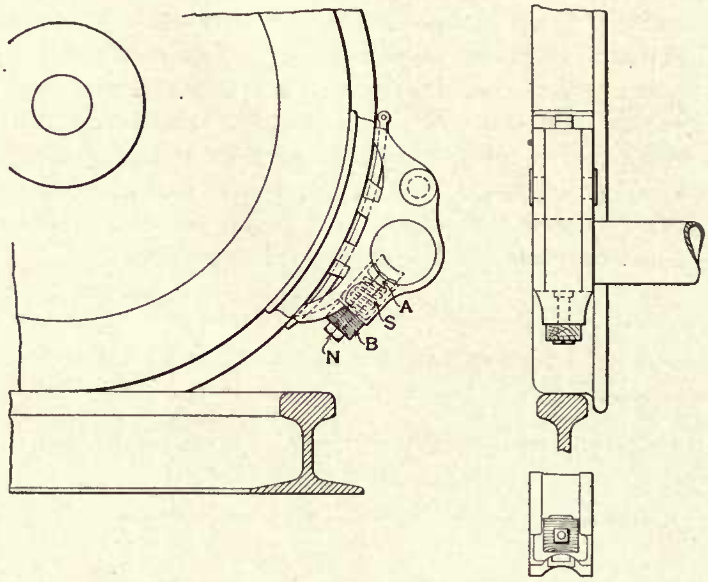



**Fig. 656—Simple Method of Applying Brake Head to Diamond Special Brake Beam.**

the threaded end of the bolt, which is fastened to the lug. Even if the nut was in such a position that it could easily

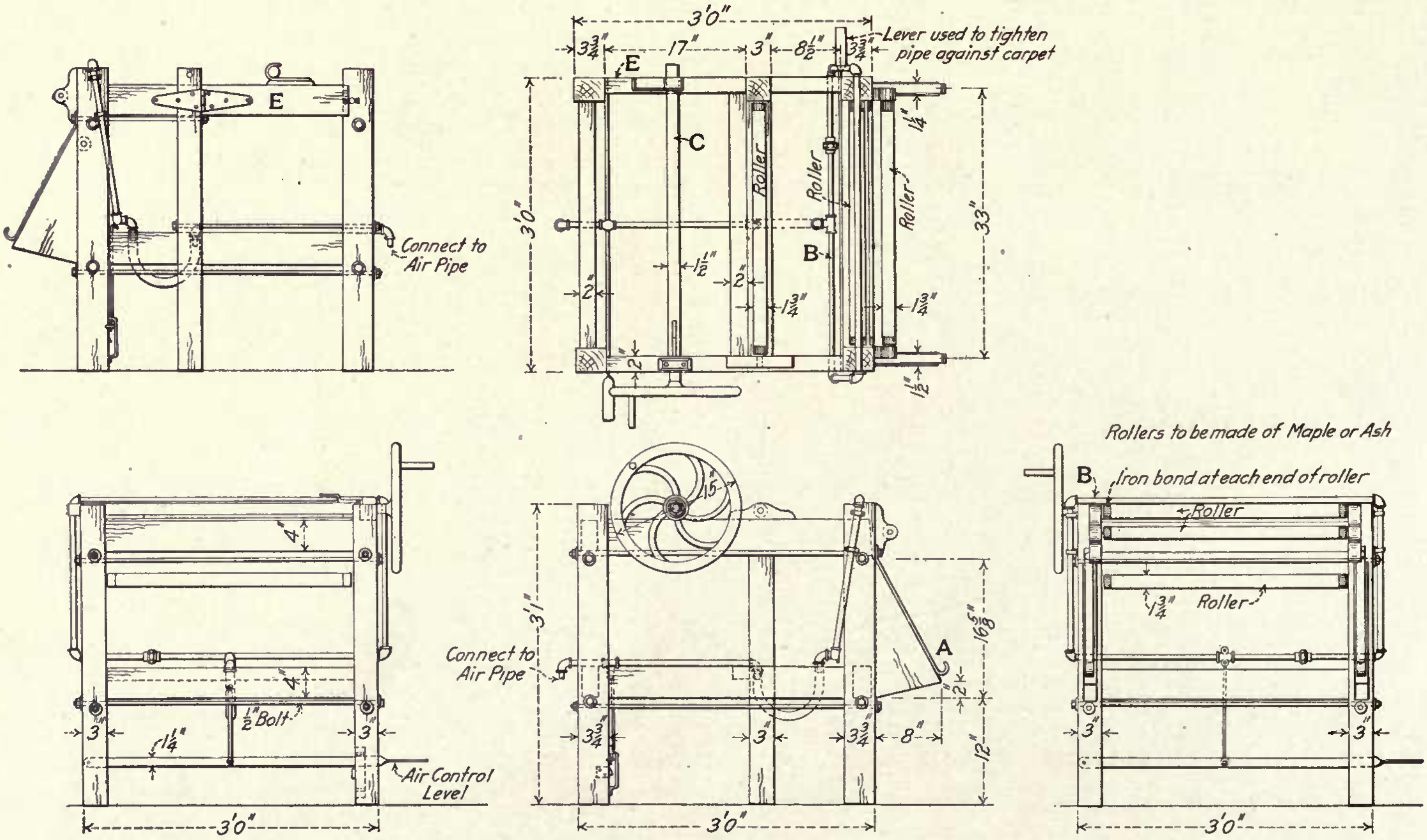



**Fig. 657—Device for Cleaning Carpets with Compressed Air.**

be gotten at, this is a tedious job; but considering the angle at which it is set and the short distance between it and the top of the rail, it is almost necessary for a man to lie flat on his back to adjust it. A simple method has been devised for overcoming this inconvenience, so simple that it is strange that it was not discovered sooner. The heads are received from the maker with the lug drawn back ready to slip over the beam. When these are received a wedge is driven in to hold the lug in this position. The nut is then removed and a block of wood about 2 in. square and 1¼ in. thick and having a ⅝-in. hole through its center, is slipped over the bolt. The nut is replaced and securely tightened. When the head is slipped over the beam the piece of wood is given one blow with an inspector's hammer, breaking it to pieces and allowing the lug to fly into the recess with a snap, locking the brake head to the brake beam.—*A. G. Pancost, Draftsman, Elkhart, Ind.*

CLAMP FOR GENERAL USE.

A clamp for general use about the coach shop, especially for drawing together coach framing, siding, etc., is shown in Fig. 658. It has a maximum range of 13 ft., which is ample for all purposes for which it may be needed. The U-shaped pieces, as well as the long rod, are made of ⅞-in. x 2½-in. iron. The long rod

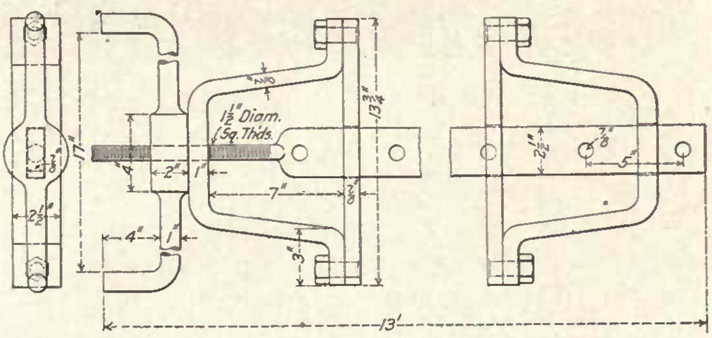



Fig. 658—Clamp for General Use in Coach Shop.

is drilled with ⅞-in. holes on 5-in. centers for its entire length, and as the square threaded screw is 9-in. long, ample provision is made for adjusting to any length. The tightening nut has two 8½-in. arms, giving a good leverage.—*C. O. Fuss, Car Shop Foreman, Central Railroad of New Jersey, Elizabethport, N. J.*

CUSHION AND CARPET CLEANER.

A simple arrangement for cleaning car seats, cushions, carpets, etc., is shown in the accompanying sketch, Fig. 659. Air, at about 75 lbs. pressure, is admitted as indicated, and causes a suction at the nozzle which is connected at the end of the 1-in. air hose, and is held on the seat or carpet. The nozzle is made of galvanized iron and has an opening ⅛-in. x 6-in. The 1¼-in. pipe coupling is soldered to it, making a permanent joint and preventing the entrance of air. An ordinary globe valve, with its interior partitions removed, is used as a three-way connection, through which air is run into the pipe. The jet or nozzle at the air inlet has five 7/64-in. round holes through which the air passes.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

DIAPHRAGM FACE PLATE STRAIGHTENER.

An effective device for straightening diaphragm face plates is shown in Figs. 660 and 661. The I-section shape

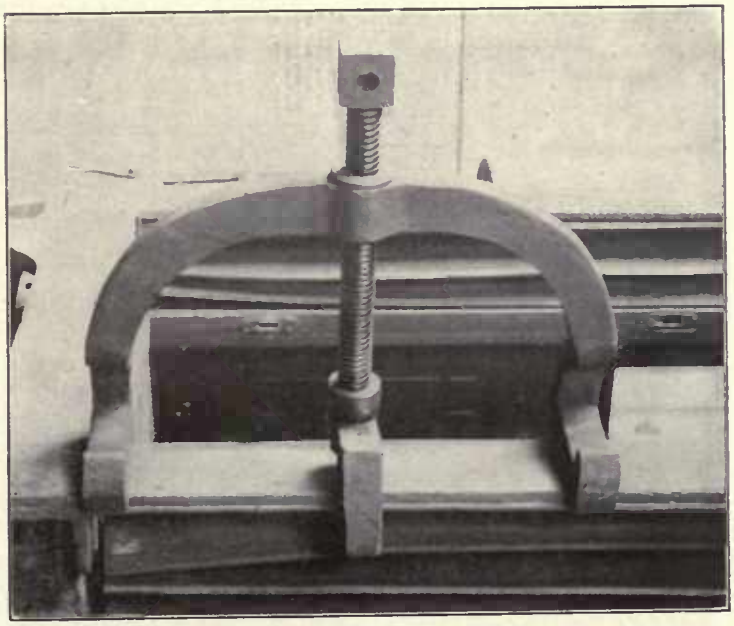
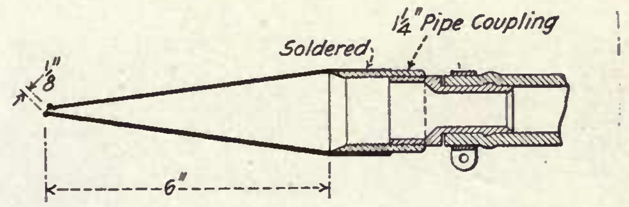


Fig. 660—Application of Diaphragm Face Plate Straightener.

of the feet provides for using the device for straightening any bend in a diaphragm face plate, the screw being run in or out as required. The screw is double square



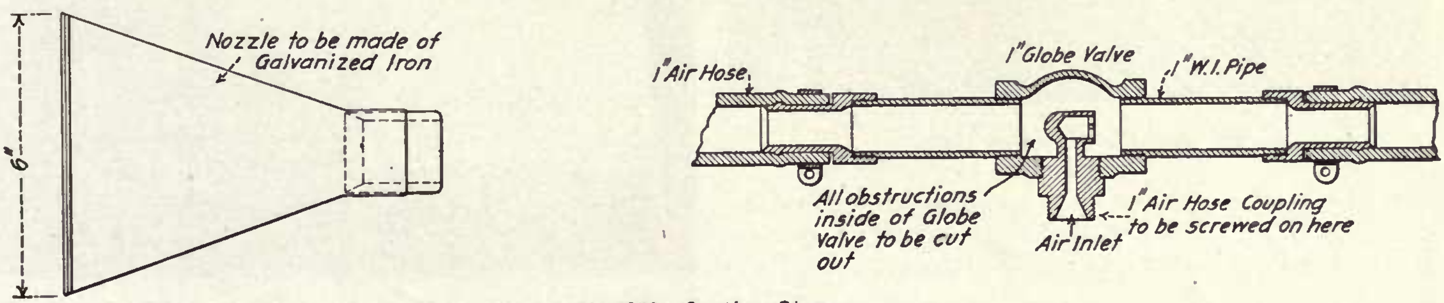




Fig. 659—Suction Cleaner.

threaded, 1¾ in. in diameter. In the majority of cases, the diaphragm is bent inward and the device is used as shown in the photo. It can be placed in about four or five minutes and the face plate straightened in about the same length of time. Without this device it would be necessary to remove the face plate, which would mean taking off the diaphragm, and in a good many instances

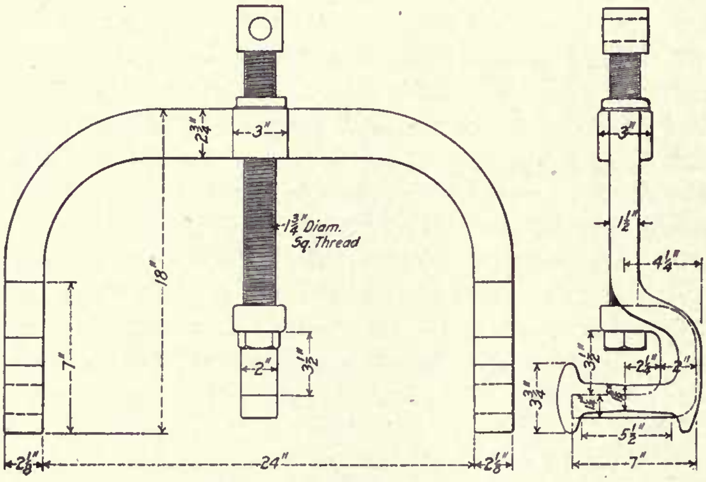



**Fig. 661—Diaphragm Face Plate Straightener.**

the tearing of it and the necessity of providing a new one. The device is also applicable to a variety of other uses such as straightening truss rods in place, or the light channel section shapes used in coach construction.—*C. O. Fuss, Car Shop Foreman, Central Railroad of New Jersey, Elizabethport, N. J.*

GAS TANK, PORTABLE, FOR TESTING PURPOSES.

A portable gas tank, used when testing the Pintsch lighting systems in passenger coaches, is shown in Fig. 662. It is an ordinary coach gas tank, mounted on cast

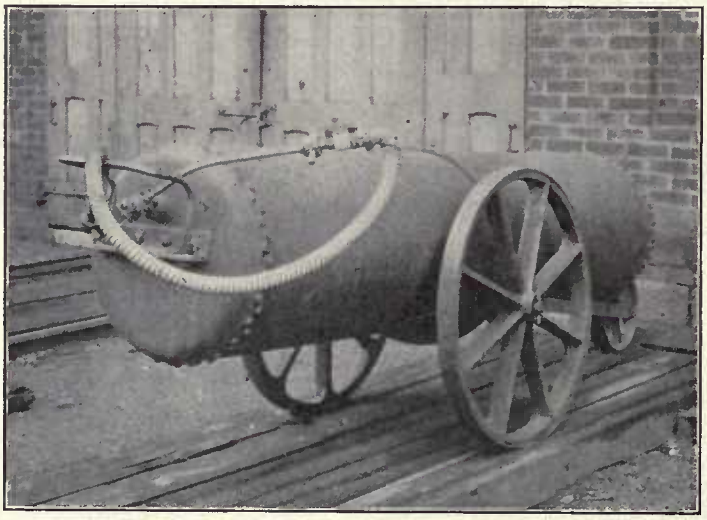


**Fig. 662—Portable Gas Tank.**

iron wheels so that it may easily be transported about the shop. It is also used for taking gas from a coach just shopped, for use in another which is ready to leave the shop. In this instance, however, it is only possible to draw gas from the car tank until the pressures in it and the portable one are equalized.—*Lehigh Valley, Sayre, Pa.*

GLUE POT.

A cast iron glue pot in the cabinet shop is shown in Fig. 663. It is 62 in. long, 29½ in. wide and 7 in. deep, and rests on cast iron feet 20 in. high. There are 12 one-gal. and 2 two-gal. kettles, giving a total capacity of about 16 gals. The iron kettles have flanges on their top edges by which they are held suspended in the water. A

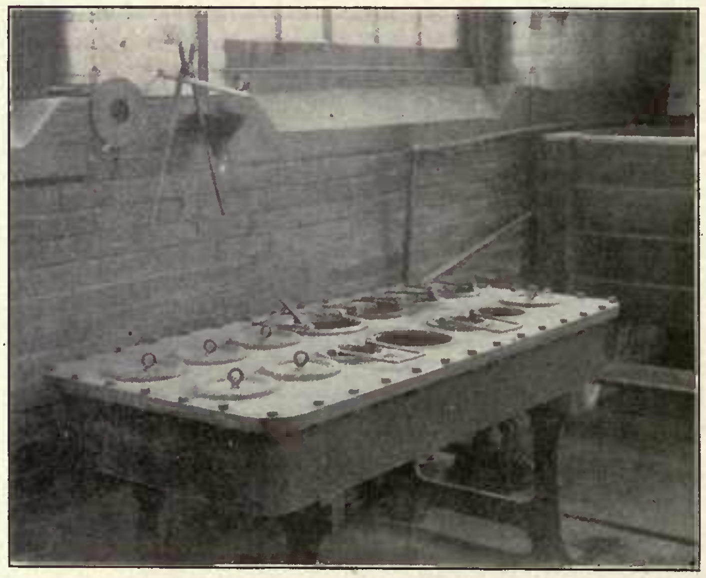


**Fig. 663—Glue Pot in Cabinet Shop.**

coil of ⅝-in. copper pipe is placed on the bottom of the pot and the steam and water regulating valves, etc., are located at one end. The pot is cast in one piece, with a flange to which the ribbed cast iron top is bolted.—*Lehigh Valley, Sayre, Pa.*

GLASS, MANUFACTURE OF CRACKLE.

Two sheets of coach glass for use in state room or toilet room panels, or any place where a non-transparent light is used, are shown in Fig. 664. The glass at the

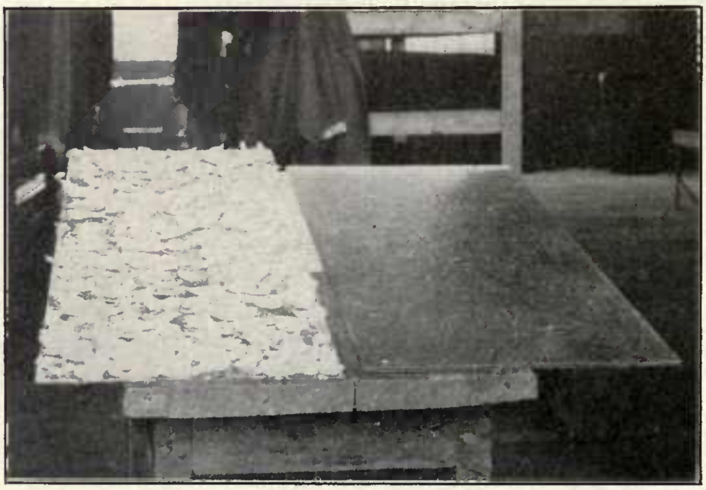


**Fig. 664—Manufacturing Crackle Glass.**

right shows the completed work, while that at the left is in the course of preparation. The sheet of glass is first thoroughly sanded by a sand blast. This gives it a rough surface. It is then coated with a layer of specially prepared "Noodle" glue, about 3/32-in. thick, after which it is placed in an even temperature room, about 75 deg. to 80 deg., and left there until the glue dries. In drying, the glue surface cracks and the small pieces curl up as shown on the sheet of glass at the left in the illustration. As the surface of the glass is roughened by the sand blast, the glue adheres to it and in drying thin scales of the glass are carried off by the glue. There is, of course, no fixed figure, but very fantastic shapes and designs form. To make what is called a much finer crackle, a piece of glass may be put through the process a second time.—*Lehigh Valley, Sayre, Pa.*

### JACK, PNEUMATIC.

A pneumatic jack, which is an efficient and necessary coach shop kink, is shown in Figs. 665 and 666. In jacking up a coach it is, of course, necessary to use two

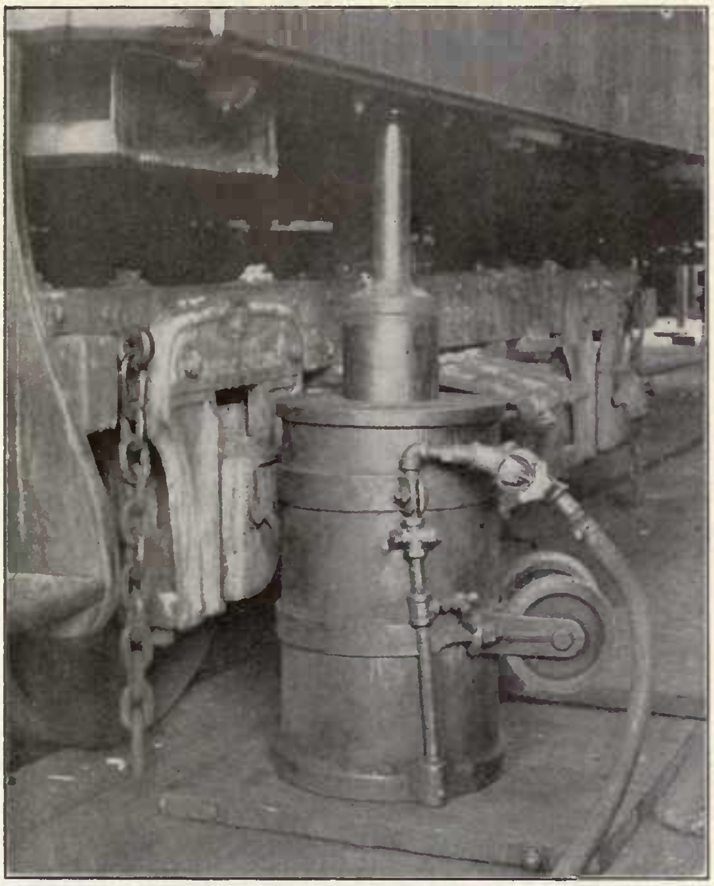


Fig. 665—Pneumatic Jack for Lifting Coaches.

jacks under each end. Air hose connections are made to operate the jacks simultaneously, which provides for their moving equally, both as to speed and travel. One man operates the valve, while the second man arranges the blocking and different height horses on which the cars are placed after the trucks are removed. The cylinder is made of a piece of tubing, 17 7/16 in. in diameter by 24 in. long. The top and bottom heads are made of cast iron, as are the piston head, the follower plate and the wheels. The bracket which carries the wheels is made of cast steel. The plunger is made from a piece

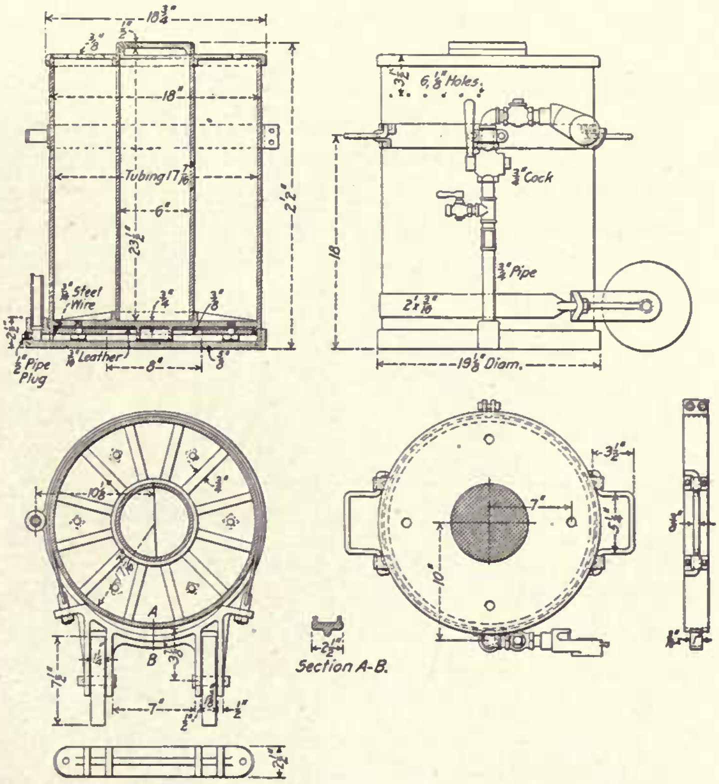



Fig. 666—Details of Pneumatic Coach Jack.

of 6-in. pipe, which screws into the piston. Air enters through a port cast in the bottom head. The drawing shows the original design using a cap on the plunger, but this has been changed, as shown in the photo, to a longer ram, by the use of which it is not necessary to block up to the sill, but the ram bears directly against it. —*C. O. Fuss, Car Shop Foreman, Central Railroad of New Jersey, Elizabethport, N. J.*

### JACK, PNEUMATIC.

Modern passenger car equipment has grown so heavy that something better than a hand or ratchet jack is required for lifting the cars in order to remove or re-

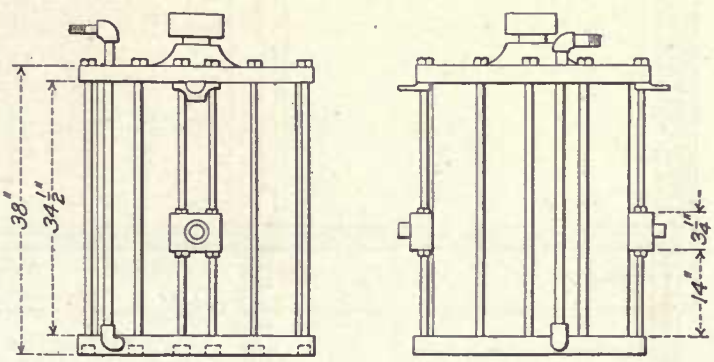


Fig. 667—17-inch Air Jack for Lifting Coaches.

place the trucks. We have constructed four 17-in. air jacks (Fig. 667), one of which is placed under each corner of the car. The two jacks at each end are connected with the same air line and are operated by the same valve, so that the end of the car is raised evenly. These jacks have been in service for eight months and have not required any repairs, and it looks now as if they would operate indefinitely without requiring any. Their use has greatly reduced the amount of time required for removing and replacing the trucks when it is necessary to change the wheels. The cylinders of the jacks are constructed of ½-in. boiler steel, which is rolled to the proper size for boring and is welded instead of being riveted. A two-wheel buggy has been constructed which

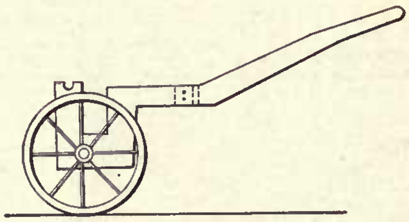


**Fig. 668—Buggy for Transporting Air Jacks.**

carries the jacks in such a way that the load is evenly balanced and they can be conveniently moved from place to place about the yard or through the shop. The handle of the buggy (Fig. 668) is raised and the uprights, which have U's at the top, are pushed under the two lugs on the jack. By lowering the handle the jack is raised off the ground and may be pushed about the yard.—*Theodore Rowe, Foreman, Great Northern, Jackson Street Shops, St. Paul, Minn.*

JACK, PNEUMATIC.

A portable air jack is shown in Fig. 669. It is supported on two pairs of wheels through two springs in such a way that when no load is on the jack the springs lift it from the floor, making it portable. When the load is applied the springs compress, allowing the jack to rest on the floor. The advantage of this provision is apparent. The cylinder is 14 in. in diameter and the piston has a 16-in. stroke. The springs are 2 in. in diameter and 8 in.

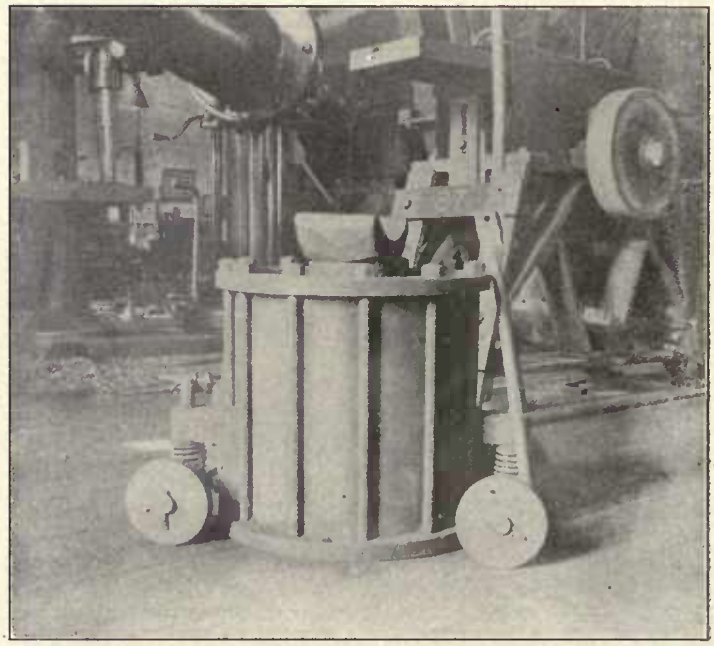


**Fig. 669—Portable Air Jack.**

high and are made of ¼-in. steel.—*T. E. Freeman, General Foreman, and A. G. Wright, Master Mechanic, Chicago, St. Paul, Minneapolis & Omaha, Sioux City, Iowa.*

PLATING ROOM, HOT OVEN FOR.

A convenient form of plating room hot oven, for use in connection with the replating of headlight reflectors and ornamental brass work on cars, is shown in Fig. 670. It

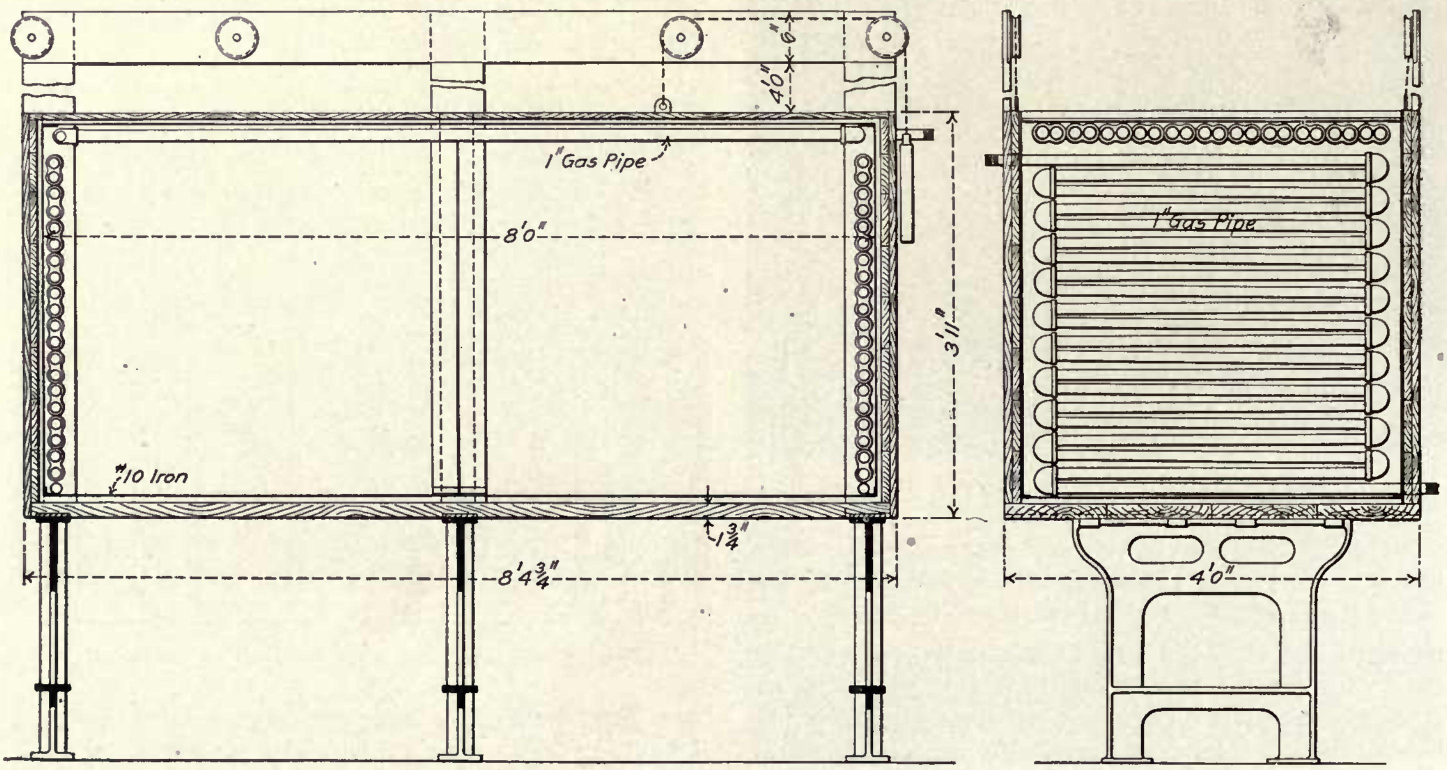



**Fig. 670—Hot Oven for Plating Room.**

is also used for drying lacquer. It consists of three substantial legs of cast iron, supporting a wooden box, lined with No. 10 iron, held at the corners by light angles, and with a space ½-in. thick between it and the wood of the box, which is filled with plaster-of-Paris for insulating purposes. Coils of 1-in. gas pipe extend along the ends and top of the box, as shown. The doors at the front are opened by sliding vertically and are counterbalanced by the weights, as shown. The total height of the dryer is 3 ft. 11 in., and its width is 8 ft. 4¾ in.

### PRESS, CLAMPING.

A clamping press for use in the cabinet shop is shown in Fig. 671. This is used when glueing together several sections of light material to be bent to circular form. A form for ceiling boards is shown in the press. The frame pieces are made of wrought iron, 4 in. wide. The threaded bolts carry cast iron heads, to which wooden

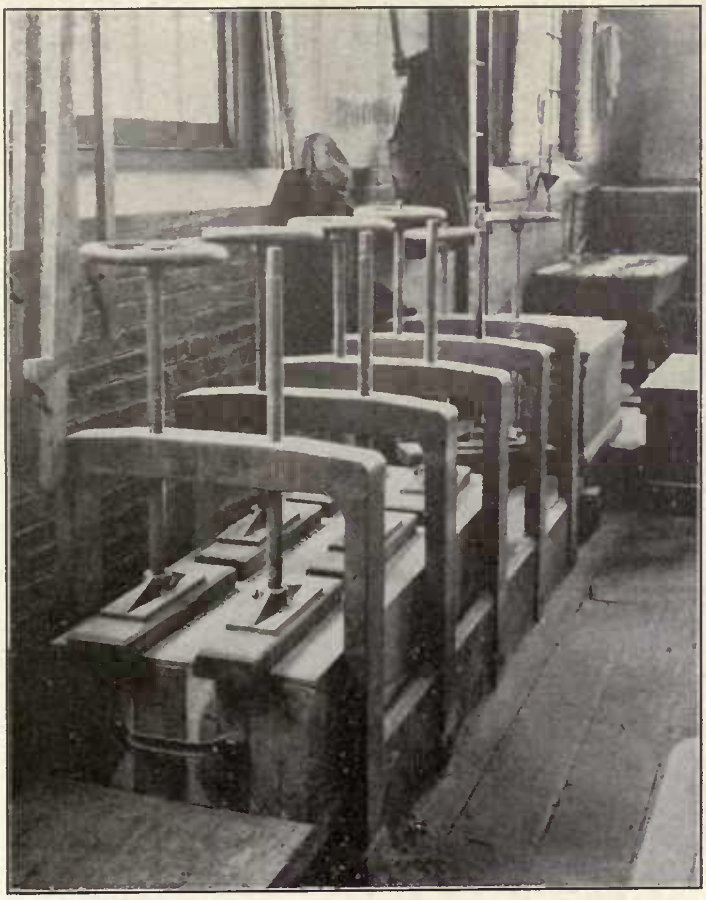


Fig. 671—Clamping Press with Glue Pot in Background.

shoes are fastened. The hand wheels slip over the square portion of the shaft, and may be shifted from one side of the press to the other.—*Lehigh Valley, Sayre, Pa.*

### SCAFFOLD, ADJUSTABLE.

The scaffolding, a portion of which is shown in Fig. 672 does not differ materially from that used in most shops, but it shows a design which is extremely simple and at the same time very effective. The brackets are made of ½-in. x 2-in. material, the horizontal and oblique members being made of one piece and bolted or riveted to the vertical member which carries the hook. The iron rounds or steps are spaced 10 in. apart. The uprights are loosely bolted to the horizontal timbers at the top and

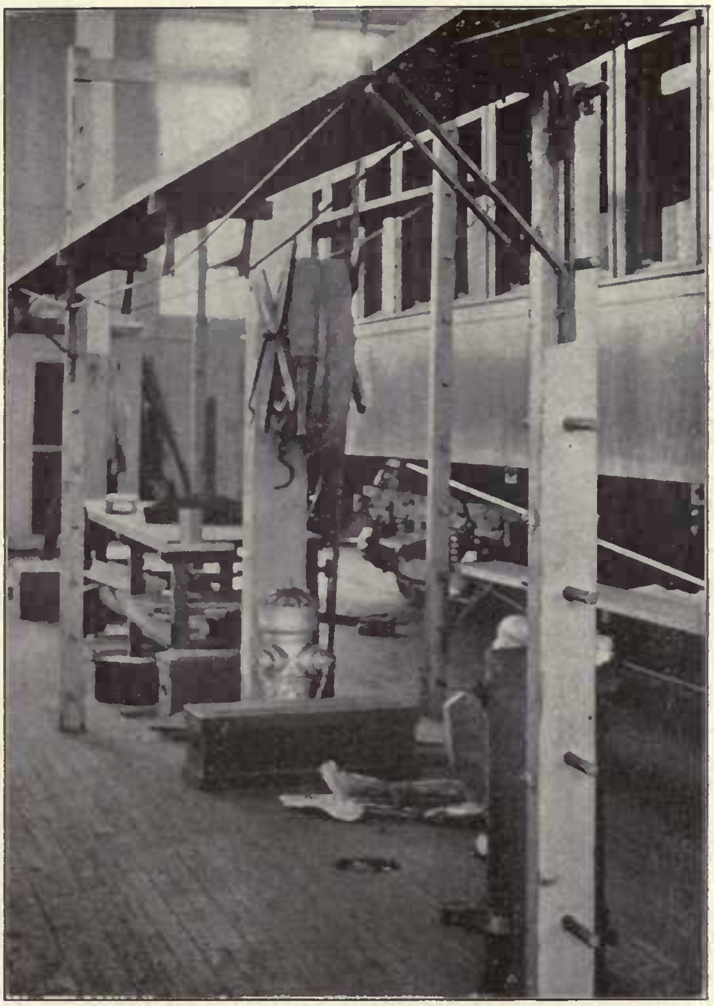


Fig. 672—Coach Shop Scaffolding.

are fastened to the floor by bolt latches. This latter provision allows for swinging the uprights in to the center post so as to be out of the way when not in use. The top cross member which is shown indistinctly in the upper left hand corner of the illustration is rigidly bolted to the shop building columns about 10 ft. 6 in. from the floor The runways are heavy and are trussed with ⅜-in. rods, the queen posts being made of 1-in. pipe, flattened and notched at the lower end.—*C. O. Fuss, Car Shop Foreman, Central Railroad of New Jersey, Elizabethport, N. J.*

### SCAFFOLD, ADJUSTABLE.

A coach shop scaffolding, with the widest possible range of adjustment, is shown in Fig. 673. The flanges of the end casting act as guides and also provide metal bearing surfaces for the truss rod bolts. The pulley jaw is made separate, of wrought iron, and is secured by a nut on the under side of the scaffold. Pulley wheels, similar to those shown, are mounted near the tops of the posts. Special features of this scaffold are its quick adjustment; the safety afforded; the unusual distance, 11 ft. 4 in., over which adjustment is possible; and the provision for

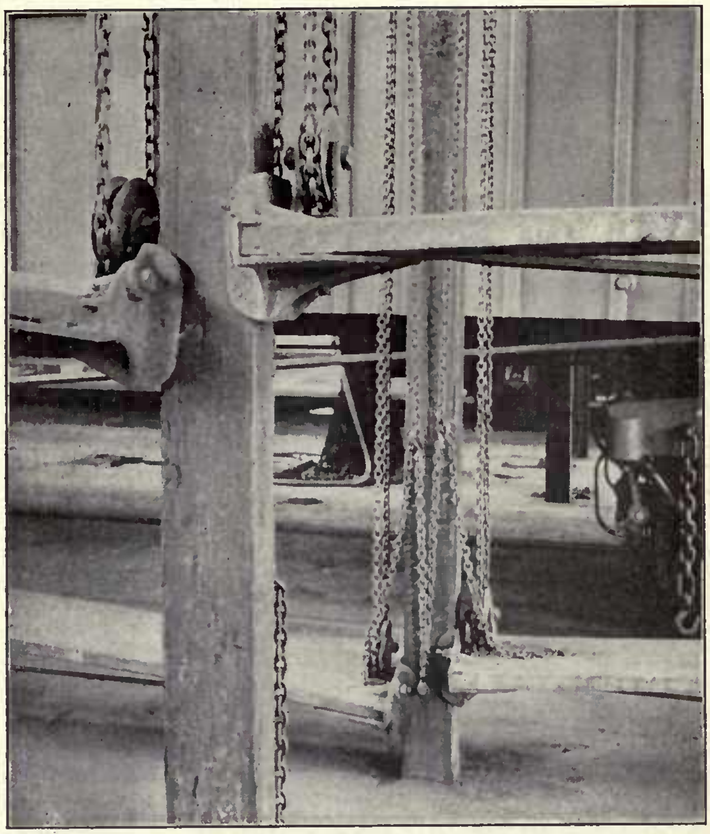


Fig. 673—Details of Adjustable Scaffold.

quickly raising the scaffold to the top of the posts and entirely out of the way when it is not being used. The short chains, about 3 ft. long, that are fastened to the posts near the bottom have hooks at the other ends which engage the chains that are used in raising and lowering the scaffold, thus locking the scaffold in any position to which it may have been adjusted.—*Lehigh Valley, Sayre, Pa.*

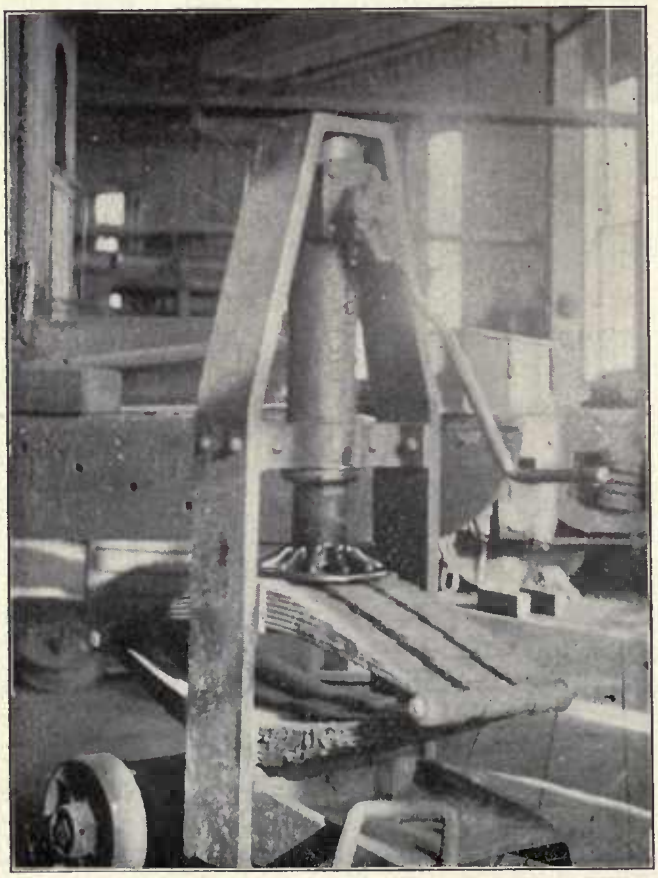


Fig. 674—Elliptical Spring Compressor.

### SCAFFOLD, ADJUSTABLE.

A handy and quickly adjustable scaffold bracket in use in the car shops is shown in Fig. 675. The interesting feature of this bracket is the fact of its being counterbalanced by the swing weight making it easily adjustable and self-fastening. The strips of ¾-in. x 4-in. iron are bolted to the post and held a few inches from it by the filler pieces. Oblong holes are partly punched at intervals along these strips, and the metal is pushed back. This acts as a guide and pushes the holding pin, at the lower end of the bracket foot, out of the opening when the scaffold is to be moved upward. It is, therefore, only necessary to exert a slight pressure upward to raise the bracket and scaffold.—*Long Island Railroad, Morris Park, N. Y.*

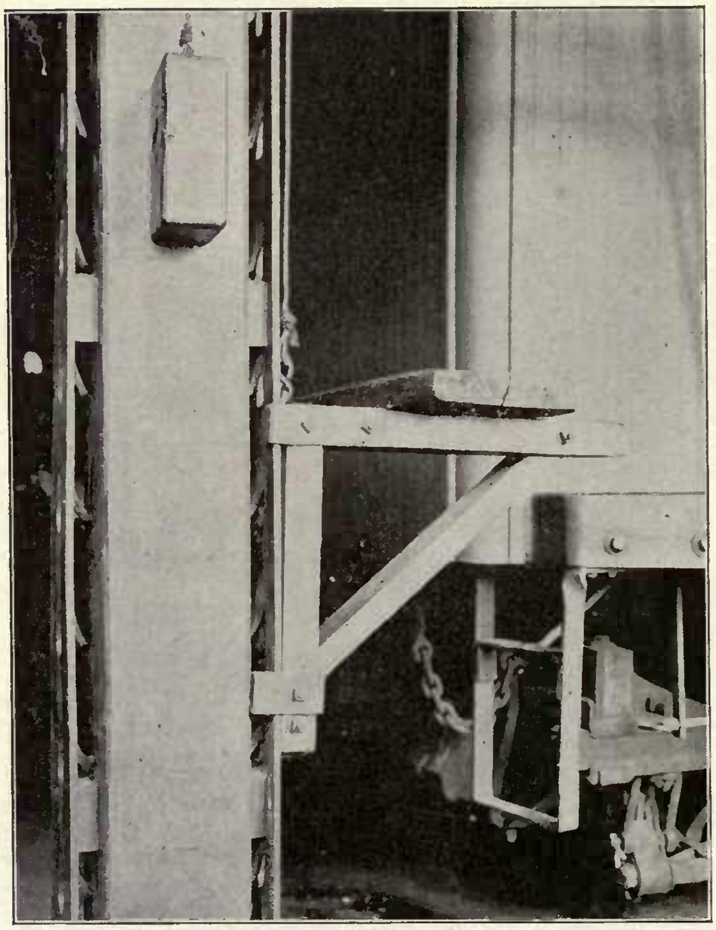


Fig. 675—Adjustable Scaffold Bracket.

### SPRING COMPRESSOR.

It is hard work, with screw or hydraulic jacks, to place a spring in a truck without some method of compressing and holding it to its loaded height. The illustrations, Figs 674 and 676, show a compressor which is easily and cheaply made, comparatively little machine work being necessary. The main machining is confined to beveling off the flanges on one side of the I-beam which constitutes the base plate. The upright is made of 1-in. x 6-in. wrought iron, forged to the shape shown, with the ends meeting on the under side of the base plate, to which it is securely fastened by ¾-in. bolts or rivets. The inverted jack is fastened at the top and is also held by the double clamp. A spring is compressed slightly below its loaded height and then two links are slipped over its

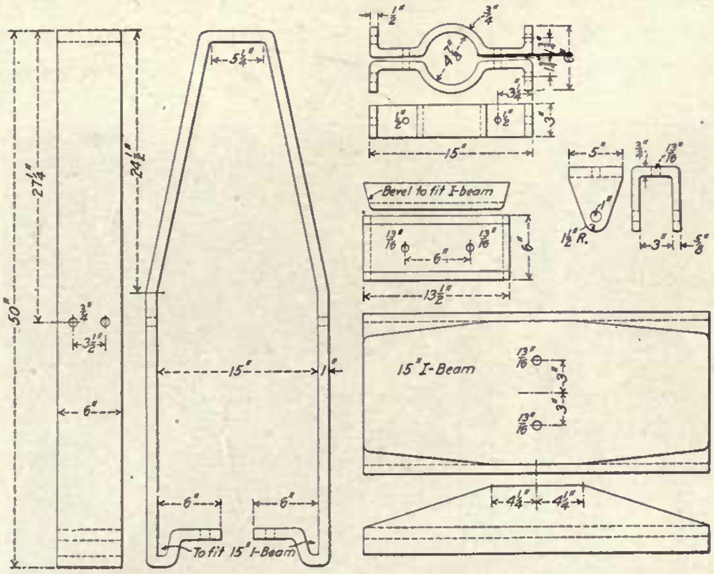



Fig. 676—Details of Elliptical Spring Compressor.

ends. These links, one of which is partly shown in the photograph, hold the spring compressed, while placing it in its position in the truck. After it is finally placed and the weight of the truck is on it, the links are easily removed. Being mounted on wheels, the spring compressor may easily be taken to any part of the shop.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### SPRING TESTER.

A home-made device for testing the elliptical springs on passenger equipment is shown in Fig. 677. The air cylinder is 18 in. in diameter and was taken from an old hydraulic jack. The pressure per square inch on the cylinder is indicated by the air gage. A table on the wall back of the machine shows the total pressure on the spring to corrospond to the various gage pressures, and is as follows:

| Pressures | | | | | |
|---|---|---|---|---|---|
| Gage. | Total. | Gage. | Total. | Gage. | Total. |
| 10 | 2,544 | 42 | 10,687 | 70 | 17,812 |
| 20 | 5,089 | 45 | 11,451 | 75 | 19,085 |
| 25 | 6,361 | 48 | 12,214 | 80 | 20,357 |
| 30 | 7,634 | 50 | 12,723 | 85 | 21,629 |
| 35 | 8,906 | 55 | 13,995 | 90 | 22,902 |
| 38 | 9,669 | 60 | 15,268 | 95 | 24,174 |
| 40 | 10,178 | 65 | 16,540 | 100 | 25,447 |

The springs are checked as to the height under the load which they must carry on the car, and if found deficient are reset. Ordinarily the springs are tested only when there is some question as to their capacity. The apparatus is also found useful for compressing the springs and placing a clamp over them to facilitate placing them in the trucks. Formerly a spring was used to force the piston upward when the pressure was released, but it did not prove strong enough, and provision was made for allowing the air to enter underneath the piston when it was desired to force it upward.—*Erie Railroad, Buffalo, N. Y.*

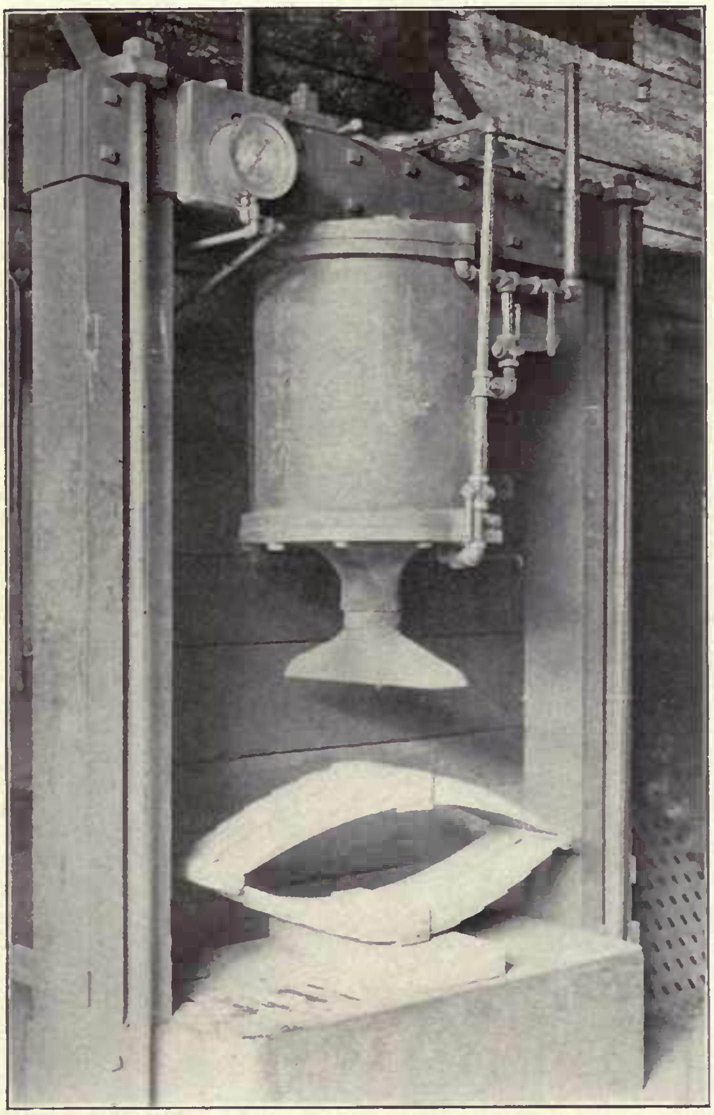


Fig. 677—Spring Testing Apparatus.

### SPRING TESTER.

The coach spring testing machine shown in the accompanying illustration, Fig. 678, is used for every coach spring. Freight car brake cylinders, arranged in tandem, connect to a common crosshead and exert an even pressure on the spring. The springs are handled to the machine by a pneumatic hoist, running on an overhead track, and by the hooks shown in the illustration. A table is posted on the side of the building near the machine, which shows the pressure to which the springs should be tested. After the spring is in position and the wooden block is placed above it as shown, air is admitted to the cylinders. The spring is then given the pressure which it should withstand according to the table, when its height is measured. If the spring shows the correct loaded height it is O. K., otherwise it is rejected. The chain, weight and lever arrangement shown provides for lifting the crosshead, pistons, etc., when the air is exhausted at the conclusion of a test. This machine is

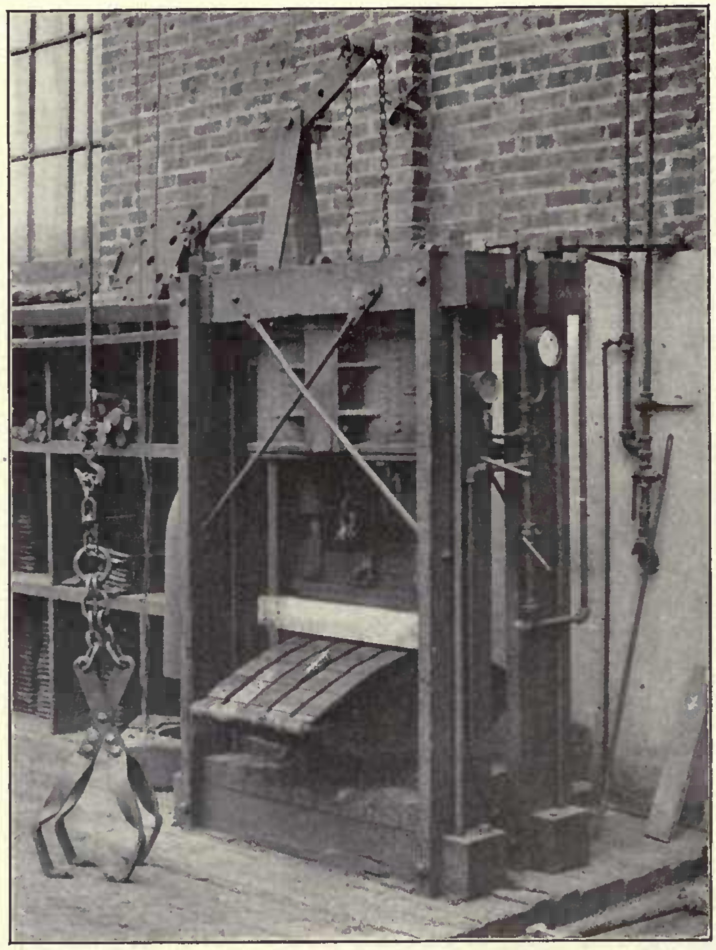


Fig. 678—Coach Spring Testing Machine.

located just outside the coach shop near the spring storage floor.—*C. O. Fuss, Car Shop Foreman, Central Railroad of New Jersey, Elizabethport, N. J.*

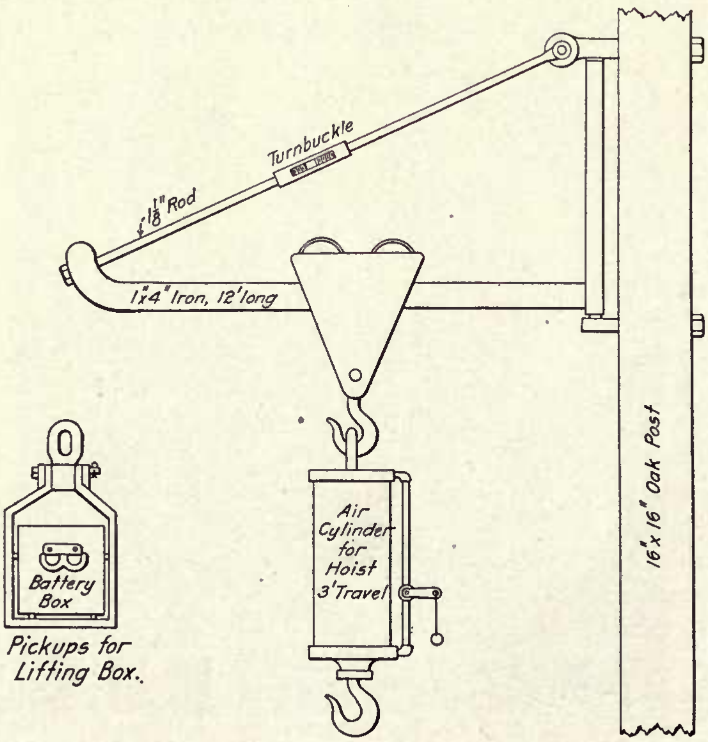



Fig. 680—Crane for Handling Storage Batteries.

STEP HOIST.

A light air hoist for holding steps in position while bolting them in place is shown in Fig. 679. The cylinder is made from a piece of brass pipe, $2\frac{1}{4}$ in. in diameter and 28 in. long. This pipe is tapped into a cast iron base, through a port in which the air enters. A 12-in. diameter plate is bolted to the cast iron one, forming a substantial base. Unless some device is used for this purpose, two men are required for putting up a pair of steps, one holding the steps in position while the other places the bolts.

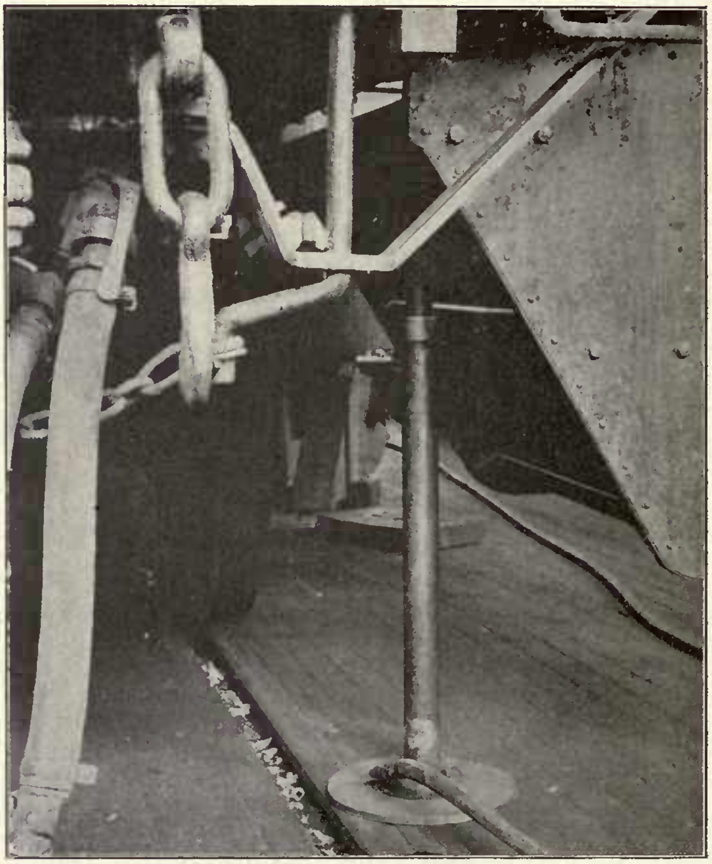


Fig. 679—Coach Step Hoist in Position.

With this hoist, one man can do all the work.—*C. O. Fuss, Car Shop Foreman, Central Railroad of New Jersey, Elizabethport, N. J.*

STORAGE BATTERIES, CRANE FOR.

The storage batteries used with the electric lighting of passenger equipment have to be handled frequently in connection with flushing them with water. These boxes weigh about four or five hundred pounds apiece when filled, and it is necessary to lift them about 3 ft. from the floor. Several workmen have been hurt in doing this by having fingers pinched or hands crushed. To overcome the difficulty a jib crane and an air hoist were constructed, as shown in Fig. 680. With this crane it is possible for one man to safely lift and clean a set of batteries in a comparatively short time; formerly three or four men were required for this work. With an air pressure of 90 or 100 lbs. the capacity of the crane is about two tons. This type of crane can also be used to advantage for serving lathes, planers or other machines which handle heavy work in the machine shop. Its construction is simple.—*Theodore Rowe, Foreman, Great Northern, Jackson Street Shops, St. Paul, Minn.*

### TRUCK WHEELS, CHANGING.

An ingenious method of utilizing the weight of a coach for power in lifting the truck from its wheels is shown in Fig. 681. The jacks have 6-in. gas pipe plungers, the top ends of which are left open. In placing the jacks under a coach, wooden filler blocks of sizes such that they will just go under the car bolsters are used. As several lengths of these filler blocks are kept on hand, any height may be obtained without using additional blocking. The car is then raised to the position shown in the upper illustration and the truck is run out. One of the walking-beam chains is attached to the truck frame and the other to the coupler shank. The coach is then lowered and its weight acts to raise the truck from its wheels. The coach is allowed to stand on the jacks while the wheels are being changed, the entire job being the work of one man. We regard the device as a most efficient one.—*H. Ashley, Master Mechanic, White Pass & Yukon Route, Skaguay, Alaska.*

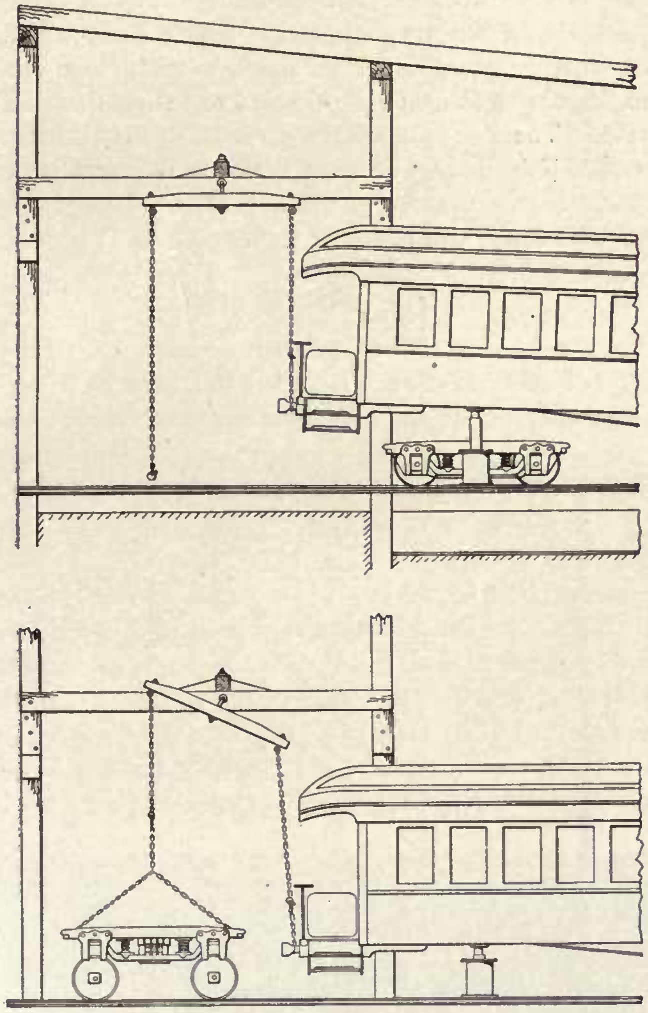


Fig. 681—Method of Handling Coach Trucks.

### WHEEL DROP PIT.

A drop pit for removing a pair of wheels from a truck without taking it from under the coach, and without raising the car except for a couple of inches, is shown in Fig. 682. It is quite similar to the drop pits often used in engine houses. The car is placed with the wheels to be taken out directly over the pit; when not in use the pit is covered over with loose planks. The car is jacked up a couple of inches and the air brake levers, brake shoes and the lower tie straps of the truck are disconnected. The air jack is run under the center of the axle and the pair of wheels is raised just enough to allow the sections of the track over the pit to be disconnected and pushed aside. The wheels are then lowered into the pit and the truck is pushed to one side; the wheels are raised and rolled off alongside the car. Another pair is lowered into the pit and placed under the car. The cylinder of the air jack is 12 in. in diameter and has a lift of about 4 ft. The pit is 48 in. wide at its upper portion, which is 42 in. deep. The lower part of the pit into which the air cylinder projects is about 21 in. wide and 48 in. deep. Twelve-inch wheels, placed 36 in. apart lengthwise, center to center, are used for the truck which carries the air cylinder.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

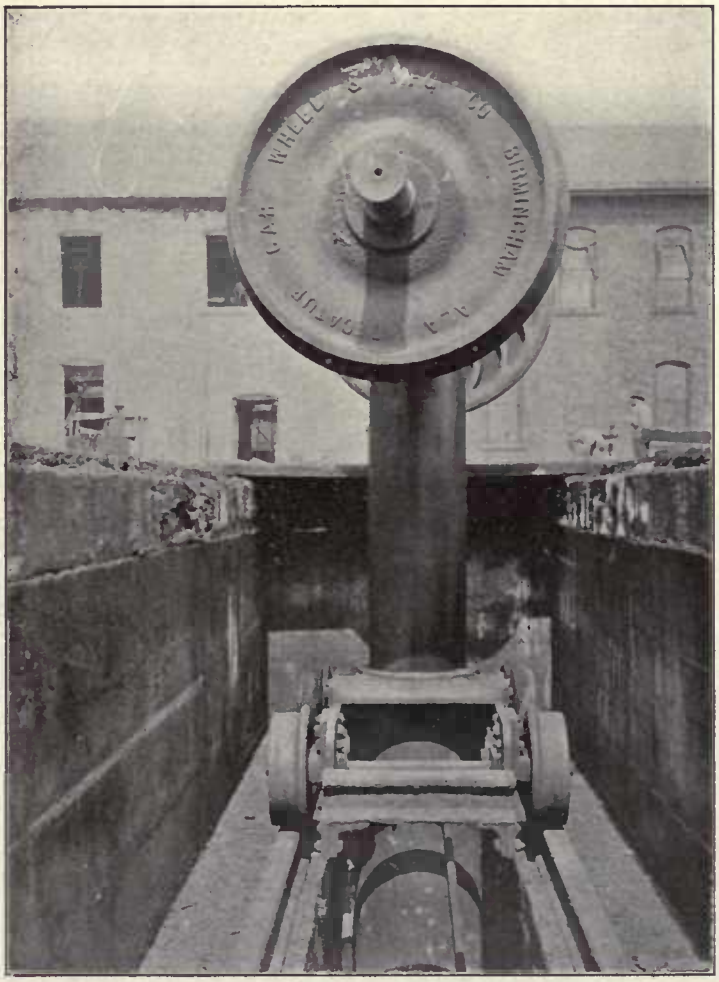


Fig. 682—Pneumatic Hoist in Wheel Drop Pit.

# Planing Mill Kinks

CROSS CUT SAW, GUARD FOR.

A splendid safety guard for use on cross cut saws has been devised by W. T. Duffin, foreman of the passenger car department, and is shown in Fig. 683. This guard, of galvanized iron, is attached to the lower end of a piece of pipe, which fits in another piece of larger diameter, as shown, and which has a cord attached at its upper end

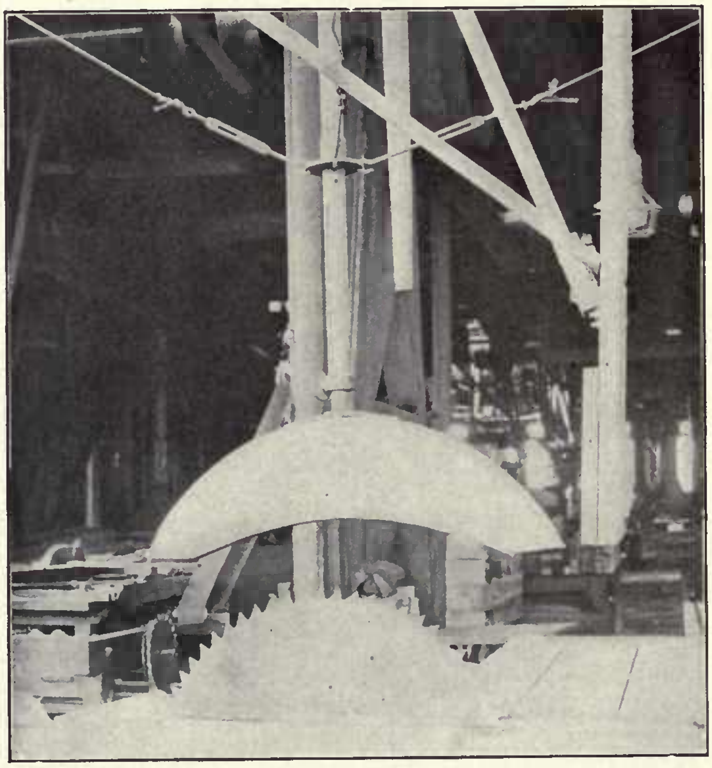


Fig. 683—Substantial Safety Guard for Cut-off Saws.

which extends upward through the larger pipe and over a couple of pulleys to a counter weight in a box alongside one of the columns. The guard may thus be easily moved up and down and be adjusted to suit the size of the timber to be cut. When placed in the desired position it may be temporarily fastened by means of a set screw.—*Erie Railroad, Buffalo, N. Y.*

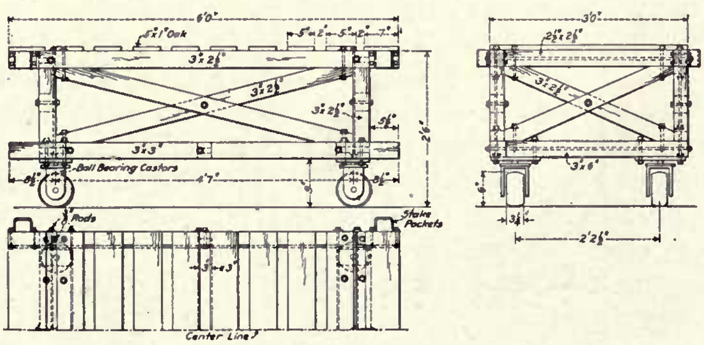


Fig. 684—Lumber Truck.

LUMBER TRUCK.

The truck for handling lumber, shown in Fig. 684, is not very heavy, and as it is mounted on ball bearing casters may easily be turned about or pushed over the floor in any direction. It is constructed largely of yellow pine, except for the oak strips which form the floor. These strips are placed 2 in. apart, so that a man can get his fingers underneath the timbers in lifting them off the truck. There are four stake pockets, so that stakes may be used if desired. The construction of the truck is clearly shown on the drawing.—*William H. Wolfgang, Draftsman, Wheeling & Lake Erie, Toledo, Ohio.*

PILOT RIBS, MAKING.

Not only is the bevel different on each end of a pilot rib, but each rib differs from the one next to it, no two being alike except the corresponding ribs on each side of

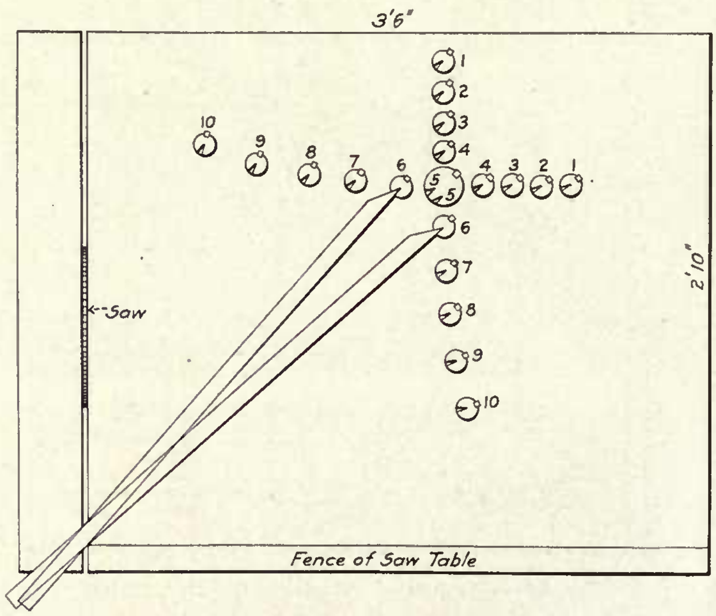



Fig. 685—Device for Cutting Bevel on Ends of Pilot Ribs.

the center rib. The device used for cutting these ribs, as shown in the accompanying illustrations, is simple in construction and is easier and quicker to operate and more accurate than the usual method of laying out each rib with a templet. It does not require a skilled mechanic to operate it and may be used with any type of cut-off saw. The device is made of hard wood, securely braced so that it will not wrap, and of about the dimensions shown on Fig. 685. It is securely bolted to the saw table to prevent it from moving out of line when in use. Each of the stops, which are numbered from 1 to 10, in two rows, represents a different bevel. These stops are 1½ in. in diameter and have small keys glued to them to keep them from turning. When not in use they are pushed down so that the tops are level with the top of the

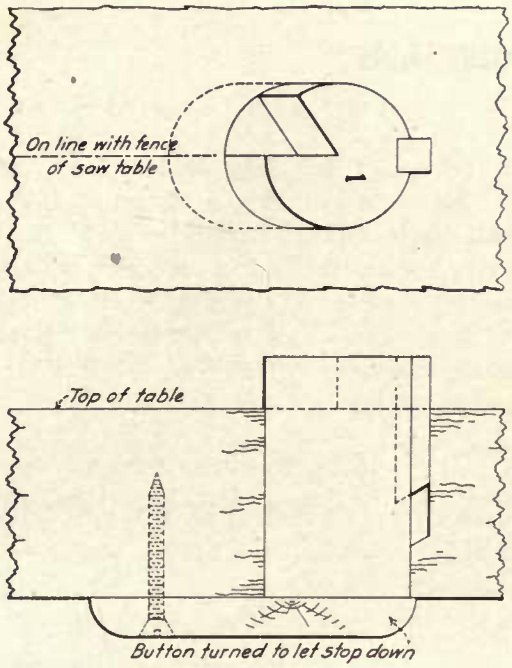



Fig. 686—Detail of Stop Used for Cutting Bevel on Ends of Pilot Ribs.

board. When in use they project above the board ½ in. and are held in place by a button or small piece on the underside of the board, which swings about a screw, as shown in Fig. 686. The material to be cut is first prepared by dressing it to the proper size. To show how the board is used, assume one of the long ribs is to be cut. The material is placed on the device with one edge resting against the end of the fence on the saw table and one end projecting over stop No. 6, similar to the first position shown in Fig. 687 with the edge lined up with the side of the notch, as shown. The other end is then cut off and the bevel thus formed is placed in the notch of the corresponding stop No. 6. The proper bevel is then cut on the other end of the rib. In this condition the rib would be a little too long, a point projecting above the top of

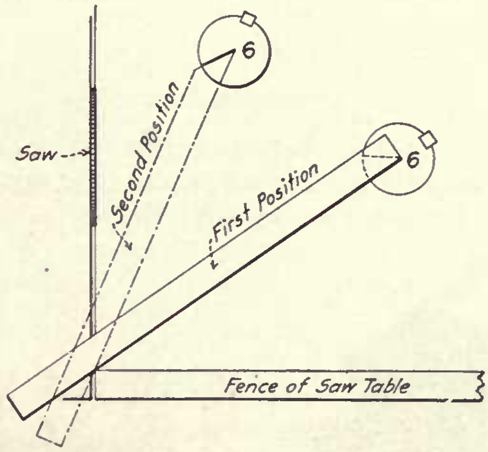



Fig. 687—Showing How the Ends of the Pilot Ribs are Cut to the Proper Bevel.

the pilot back. By means of a special stop this point is cut off at right angles to the bevel edge at the top of the rib, and the rib is then ready to be applied to the pilot. —*S. S. See, Foreman of Planing Mill, Norfolk & Western, Roanoke, Va.*

### MOLDER, SAFETY GUARD FOR VARIETY.

The most dangerous machine in a wood-working shop is the variety molder. A pair of safety guards which may easily be adjusted for any class of work and which also act as clamps or guides for holding the work down while it is being passed over the cutter is shown in Fig. 688. This device was furnished by the American Wood Working Machinery Company.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

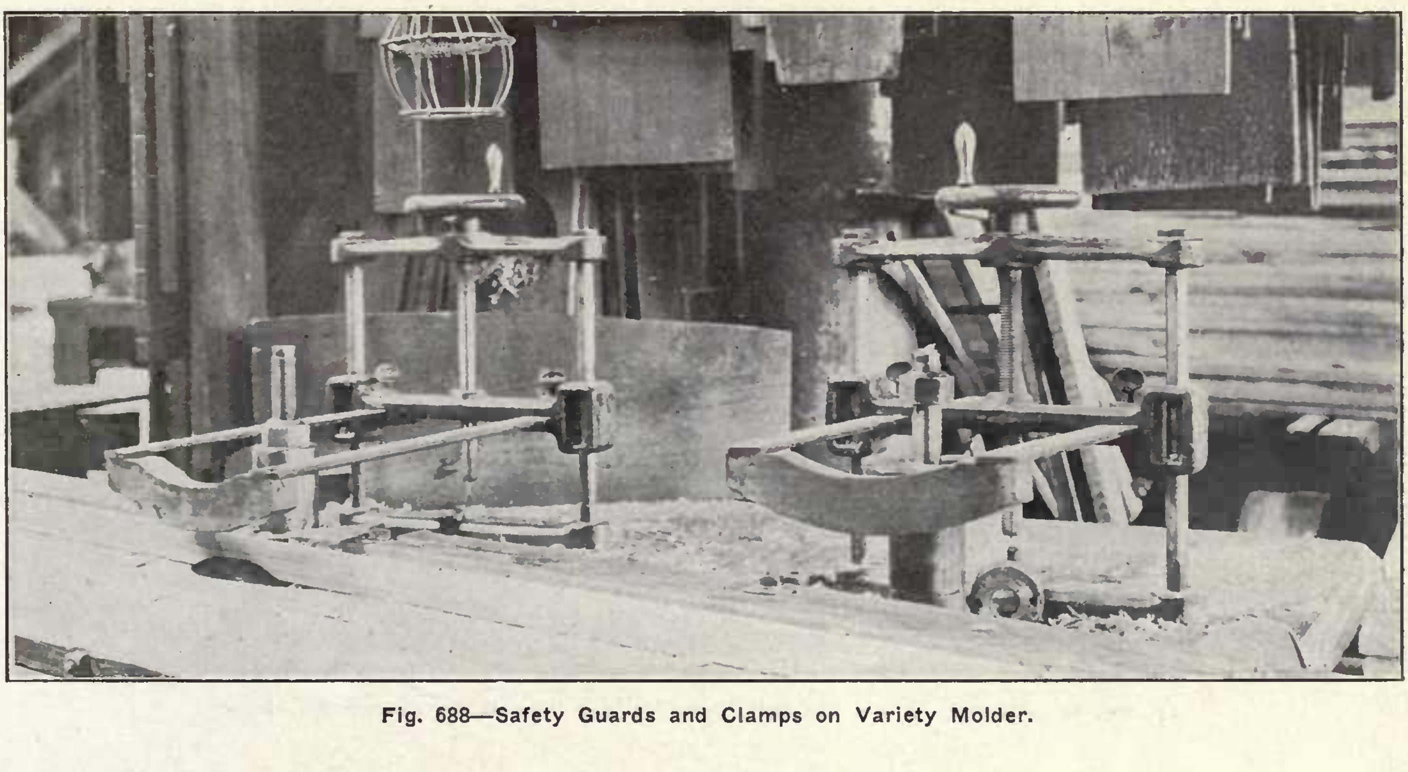


Fig. 688—Safety Guards and Clamps on Variety Molder.

# Smith Shop Kinks, Car

AIR RESERVOIR STRAPS.

Two tools used on a bulldozer, with a travel of 14½ in., built on the same plan as most presses affording a straight pressure, are shown in Fig. 689. The tool on the left for making straps for air reservoirs is a double tool; it may be reversed on the press by removing the bolts and turning it around. The arms connecting with the head pieces are interchangeable, so as to require only one pair. The straps made are for 10 in. and 12 in. reservoirs.

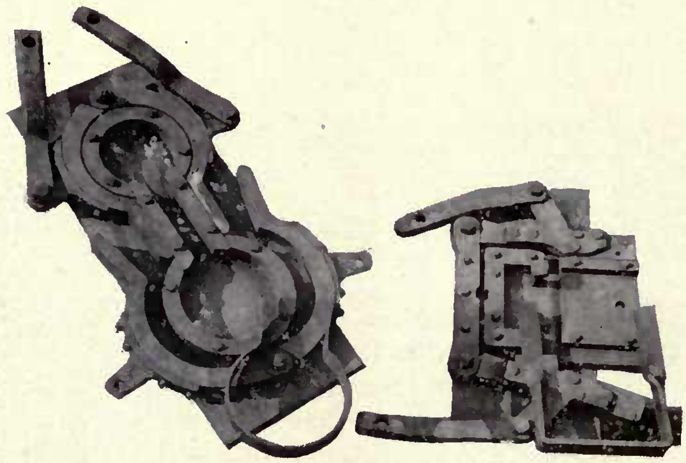


Fig. 689—Typical Tools Used on a Bulldozer.

STEPS, FREIGHT CAR.

The tool on the right is for making car steps with two bends and two quarter twists, such as shown in the illustration. This tool was suggested to me by a traveling salesman who was formerly a blacksmith foreman with the Southern Railway. I consider it the best step tool I have ever seen, as the step is completed in one heat with one stroke; in most cases, the number of steps bent on this tool in any given time is only limited by the capacity for heating them.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

BOLTS, MANUFACTURING.

To facilitate the handling of the carts in which the bolts are transported in the various stages of manufacture a concrete floor has been laid on the side of the smith shop where this work is done. The rods are brought in at the end of the shop on a special steel cart for handling bar iron, shown in Fig. 690. Two men feed the rods to the double shear shown at the left in Fig. 691, while a third man piles the pieces on the cart shown in Fig. 692,

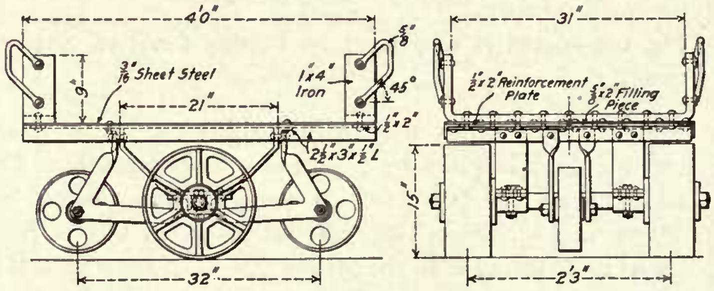



Fig. 690—Steel Cart for Handling Bar Iron.

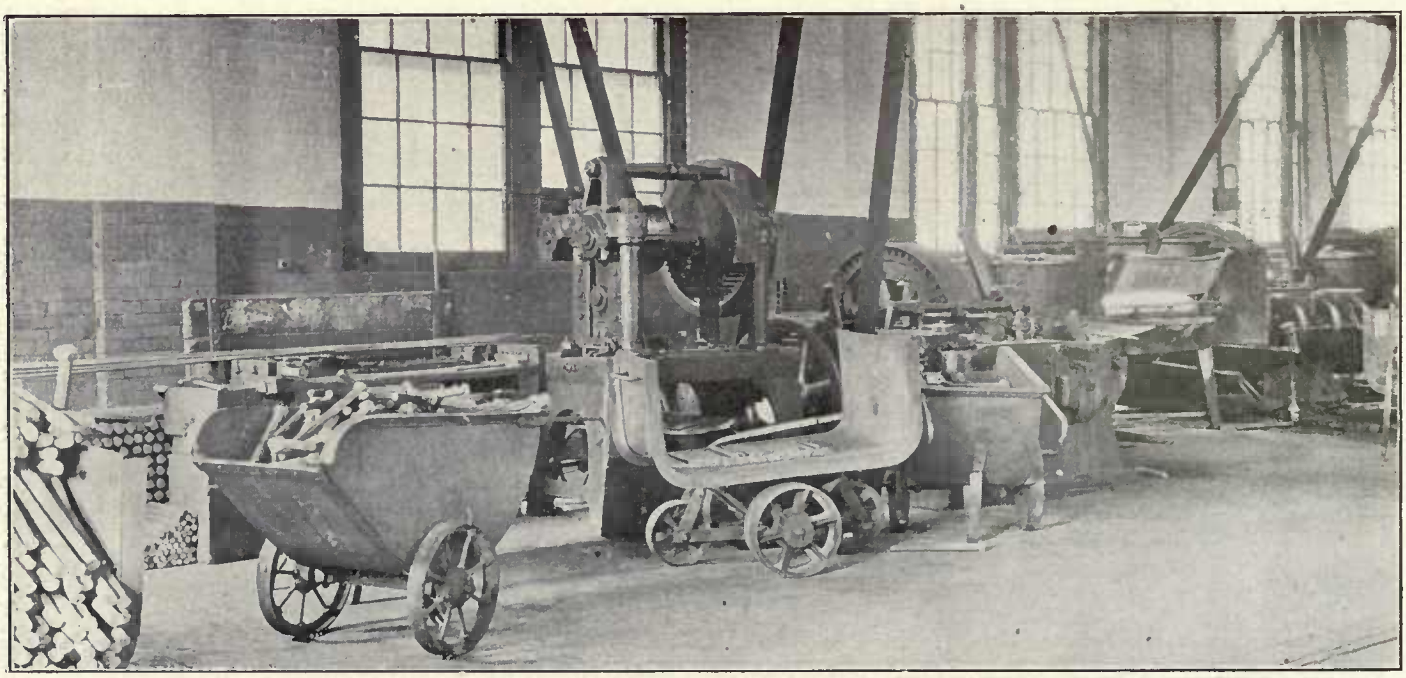


Fig. 691—Partial View of the Bolt Manufacturing Side of the Blacksmith Shop.

and also in Fig. 691, at the same time counting them. One of these carts will hold 5,000 pieces for ⅝-in. bolts. The cart is moved to one of the three Ferguson oil fur-

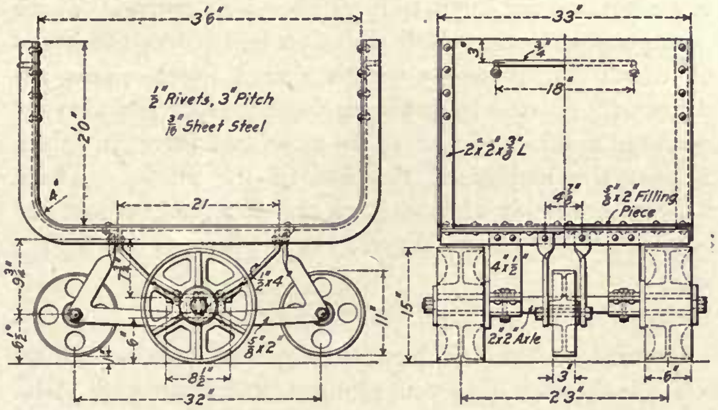



Fig. 692—Steel Cart for Iron Cut to Length for Bolts.

naces where the rods are heated, after which they are forged in either the 2-in. Blakeslee or the 1½-in. or 1-in. Acme forging machines. As the heads are forged the

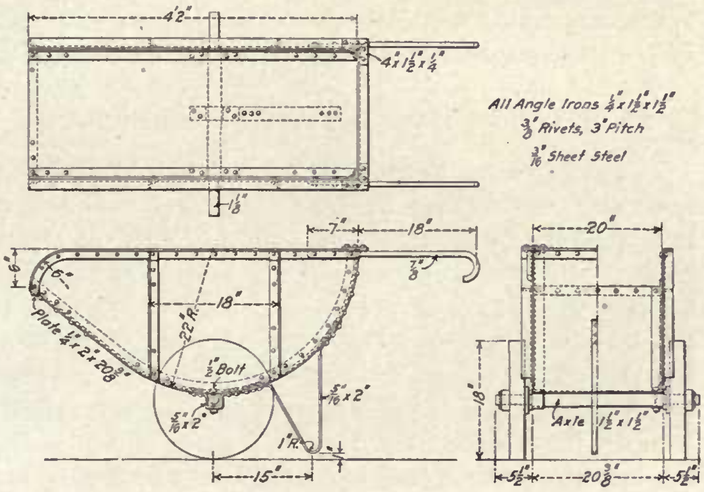



Fig. 693—Bolt Cart.

bolts are thrown into the bolt cart, shown in Fig. 693. They are then moved down the line to one of the six double head bolt cutters. A large number of bolts are also reclaimed from scrap by cutting them to shorter lengths and rethreading them.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

BOLT WAGON.

As the iron is sheared to length for bolts in the smith shop it is piled on the wagon or cart (Fig. 694), and is

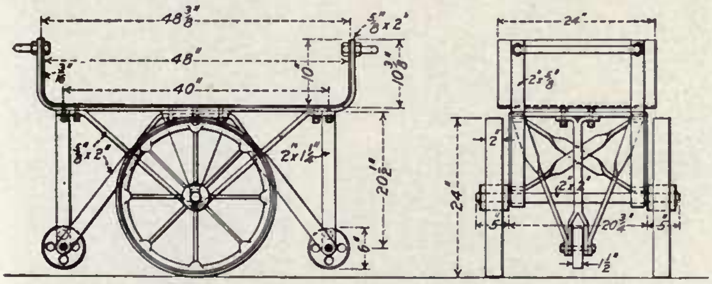


Fig. 694—Wagon Used in the Manufacture of Bolts.

moved to the furnaces, thus saving any rehandling. The large wheels are 24-in. in diameter and the small ones 6 in.—*Rock Island Lines, Silvis, Ill.*

BRAKE BEAM HANGER.

The left-hand dies shown in the photograph, Fig. 695, are used in making brake beam hangers for passenger cars. The stock, 1-in. round, is cut and bent to the shape shown in a bulldozer. After the second heat, the open end is placed between the dies and one end is formed and the weld, which falls in the center, is made. After a third heat the other end is shaped between the dies. About 25 of these hangers can be made in a day of 10 hours on an anvil, while by the above method 75 may be made in the same length of time.

BRAKE RIGGING U-SHAPED HANGER.

At the right of the photograph, Fig. 695, are shown two sets of dies for making a U-shaped hanger, used on the brake rigging of passenger cars. The piece of stock

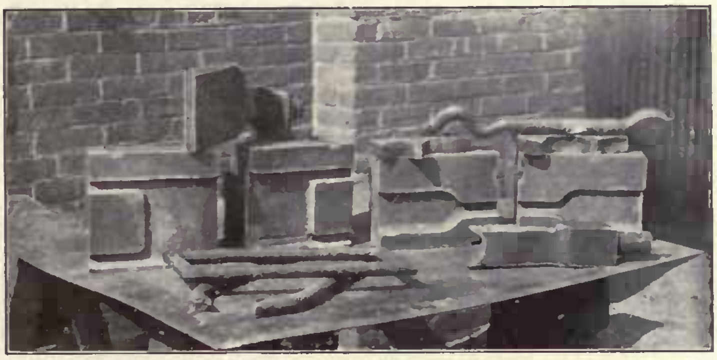


Fig. 695—Brake Beam and U-Shape Hanger Dies.

shown on top of the dies has been finally formed on one end in the large dies. The first operation is that of bending, as shown at the opposite end. The S-shape is necessary in order to get sufficient metal into the dies to form the complete end, for which a second heat is required. This bending operation is done between the formers clamped on the top of the cast iron dies. A fifth heat is necessary for bending the hanger to the U-shape. The stock used is 1¼ in. round; about 80 complete hangers can be made in 10 hours.—*Long Island Railroad, Morris Park, N. Y.*

BRAKE BEAM SAFETY CHAIN EYE BOLT.

The left-hand dies shown in Fig. 696 are used in making collar eye bolts for brake beam safety chains, a finished bolt and a piece of bent stock being shown. The eye is formed on an eye-bending machine, and is reheated for final forming and welding between the dies. It will be noticed that each die is made in two pieces, joined by two 1-in. bolts and held apart about 2 in. by the two coil springs. When in the machine, the dies first close on the stock and then the plunger strikes the pair which grip the eye and forces the parts against the other pair. The metal which bridges the space between the two sets of dies then forms the collar. The stock used is ⅝ in. round.

GRATE BAR TRUNNION HEAD.

At the right in the photograph, Fig. 696, is shown a pair of dies used in forming a grate bar trunnion head.

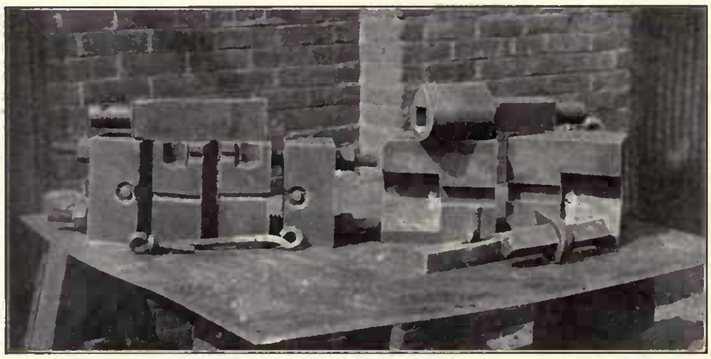


**Fig. 696—Eye Bolt and Crate Bar Trunnion Head Dies.**

This job requires 1⅝-in. square stock, which is first heated for receiving the 1¼-in. round pin. In the second operation the piece is completed.—*Long Island Railroad, Morris Park Shops, Morris Park, N. Y.*

BRAKE HANGERS, BENDING.

A set of formers used for bending brake hangers on a Blakeslee bulldozer is shown in Fig. 697. The machine is shown at full back stroke. The two wings which bend the stock are drawn full open as soon as the return stroke begins by the coil springs, which permits the formed hanger to be removed and stock for another to be placed before the wings are again carried forward. The machine, therefore, operates continuously and a hanger is formed at each revolution. The arrangement at the left is provided to center the stock. The angle-iron plate has two pins, over which the stock is placed, and the slot guides the tongs to the center of the stock. It is then carried to position in the formers, a slot in the center block guiding the tongs to bring the stock central. There is a movable block, which slides on two bolts—the heads of which are shown—through slotted holes. This arrangement permits of easily placing the stock and also for making the bends square, as the crosshead forces it tightly against the hanger at the end of the stroke. These hangers are made of 1-in. stock and 125 may be bent per hour.—*Lehigh Valley, Sayre, Pa.*

STAPLES, BENDING.

Resting on the left hand stop of the bulldozer, Fig. 697, are shown a block and plunger used in bending ½-in. staples cold. The block, which stands in an upright position when being used, is provided with six grooves for holding the straight stock. These grooves are cut at an angle, so that the stock will not fall out. The plunger is deep enough to bend the six staples at one time. The stock is cut from ½-in. scrap rods on a shear, and at an angle to provide the points. This arrangement will bend 700 of these staples per hour.—*Lehigh Valley, Sayre, Pa.*

BRAKE HANGER ENDS, UPSETTING AND PUNCHING.

The ends of the hangers, illustrated in Fig. 697, are upset and punched on a machine using the dies shown at the left in the photograph, Fig. 705. The half die at the right of the pair shows a piece of stock in position for being upset. The stock is first bent cold in the bulldozer, three pieces at a time. The pieces are then placed in a furnace, the bottom of which is 5 in. below the opening, which allows the ends to hang downward. After the end is upset, the stock is moved to the position shown in the left half die, and the hole is punched. As both plungers

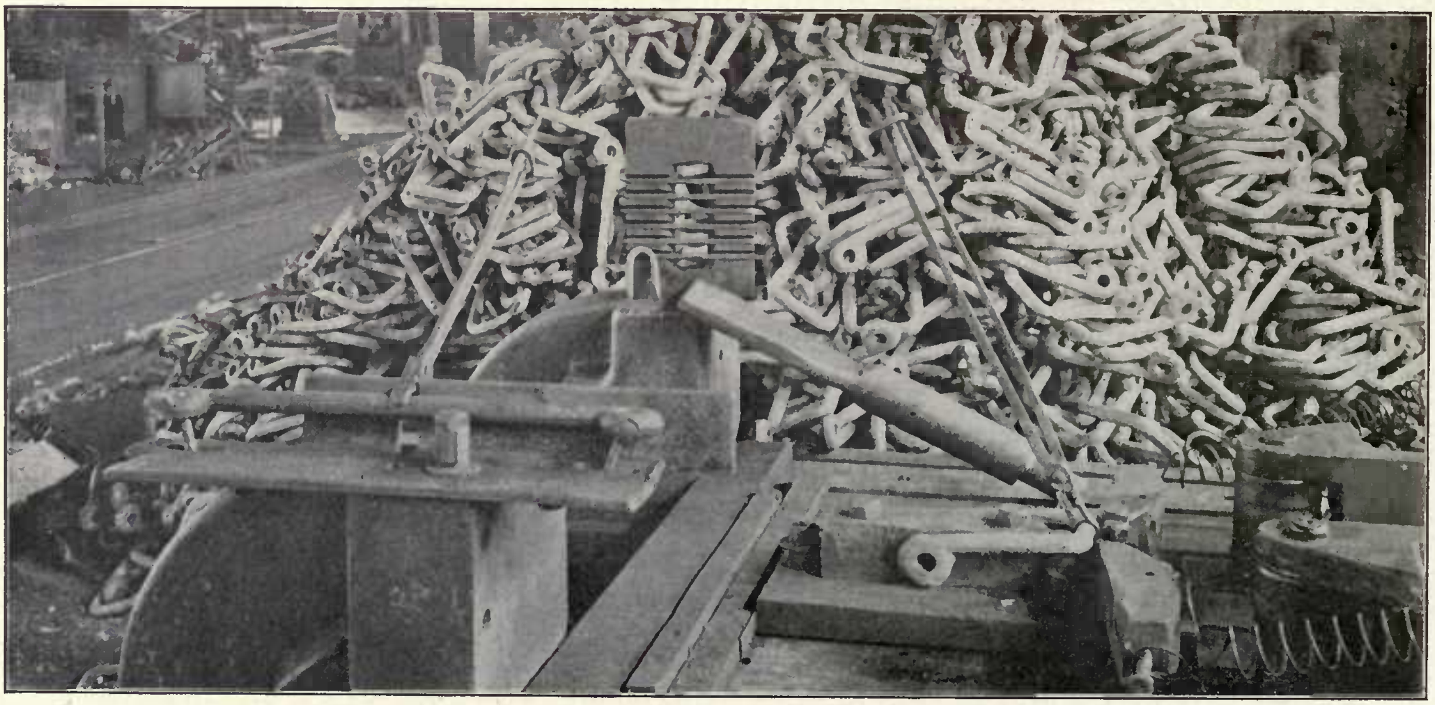


**Fig. 697—Bending Brake Hangers on the Bulldozer; also Block and Plunger for Making Staples.**

operate simultaneously, one heat only is required for both upsetting and punching. It will be noticed that the dies have inlaid blocks at the points of wear. These blocks are made of high speed steel and when the dies were first made, the steel blocks were hardened before being placed. After upsetting about 3,000 ends, it was found that the steel blocks were full of surface cracks. They were taken out, annealed, surfaced and again placed in position without hardening. About 90,000 ends have passed through dies since the blocks were renewed and they show no bad effects from the work. The large boss on the right hand die and the knife on the left hand one were used for removing the film of metal that forms when the dies do not close. This provision is not, however, necessary.—*Lehigh Valley, Sayre, Pa.*

### BRAKE HANGERS, BENDING.

A machine for bending the eyes on brake hangers is shown in Figs. 698 and 699 and 700. The photographs

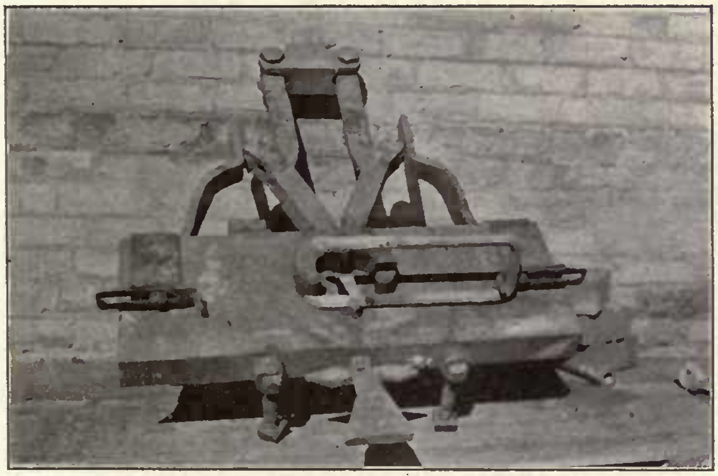


Fig. 698—Bending Machine at Beginning of Operation.

show the two positions of the machine. The adjustable fingers are set according to the length of hanger required. The complete details of the different parts are shown in the drawing. The hanger whose ends are to be bent is

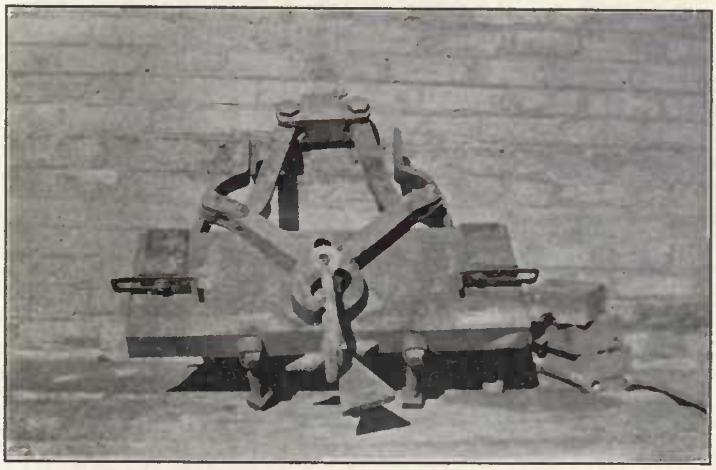


Fig. 699—Bending Machine at Close of Operation.

placed as shown in Fig. 698. As the plunger of the machine moves forward the stock is bent around the small round pin whose diameter is the same as that of the eye. Fig. 699 shows the positions of the stock and the dies at the close of the operation. To bend the other arm of the

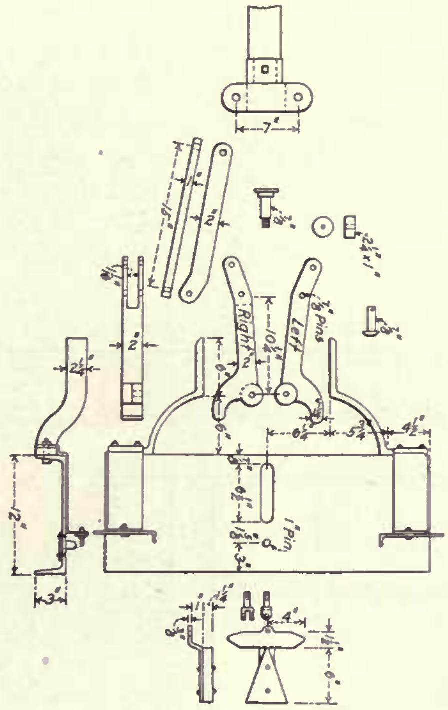


Fig. 700—Brake Hanger Bending Machine.

hanger it must, of course, be placed on the opposite side of the machine from the position shown in Fig. 700.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

### BULLDOZER, SMALL AIR-OPERATED.

The portable air-operated bending machine shown in Fig. 701 was built for bending small work, such as car

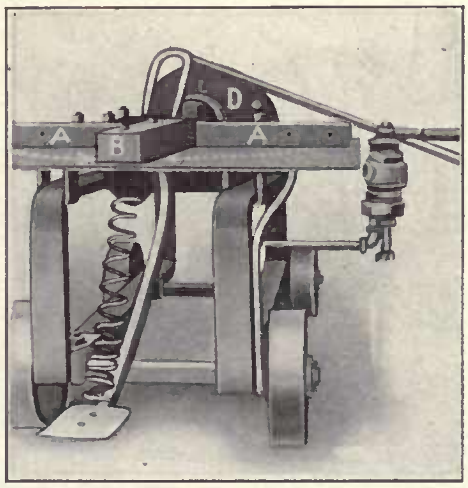



Fig. 701—Portable Air-Operated Bending Machine for Small Work.

brake hangers, stake pocket bolts, etc. The cylinder *D* is an old 12-in. brake cylinder with a suitable crosshead fitted on the end of the piston rod. The bending arms *A* are pinned loosely to the table at their inner ends and are connected to the crosshead by links. When the piston is forced outward the arms travel as indicated by the arrows. The forming block *B* is shaped to give the desired size and form to the parts that are being bent. The bending arms *A* have two holes drilled through them for bolting on different sizes of forming plates. A treadle, fulcrumed to the bottom of table, is connected to a grip block and clamps the work to keep it from slipping while being bent. Fittings for all kinds of bending are provided. This is a very handy machine for the smith shop, and we have used it to splendid advantage on the lighter classes of work.—*W. H. Fetner, Master Mechanic, and C. L. Dickert, General Foreman, Central of Georgia, Macon, Ga.*

### BRAKE SHOE KEYS, MANUFACTURE OF.

Two special devices designed by the general blacksmith foreman of the Topeka shops, George Fraser, and used for forging and finishing brake-shoe keys out of old scrap iron are illustrated in Figs. 702 and 703. The first device, Fig. 702, is an attachment to the bulldozer for forging the key to shape. Two keys are forged at one time in one operation, one on each side of the plunger. These are cut apart and bent to shape in one operation by the shear attachment, Fig. 703, to a power punch or shears. These devices have proved very economical. Keys were formerly forged by hand at the rate of about

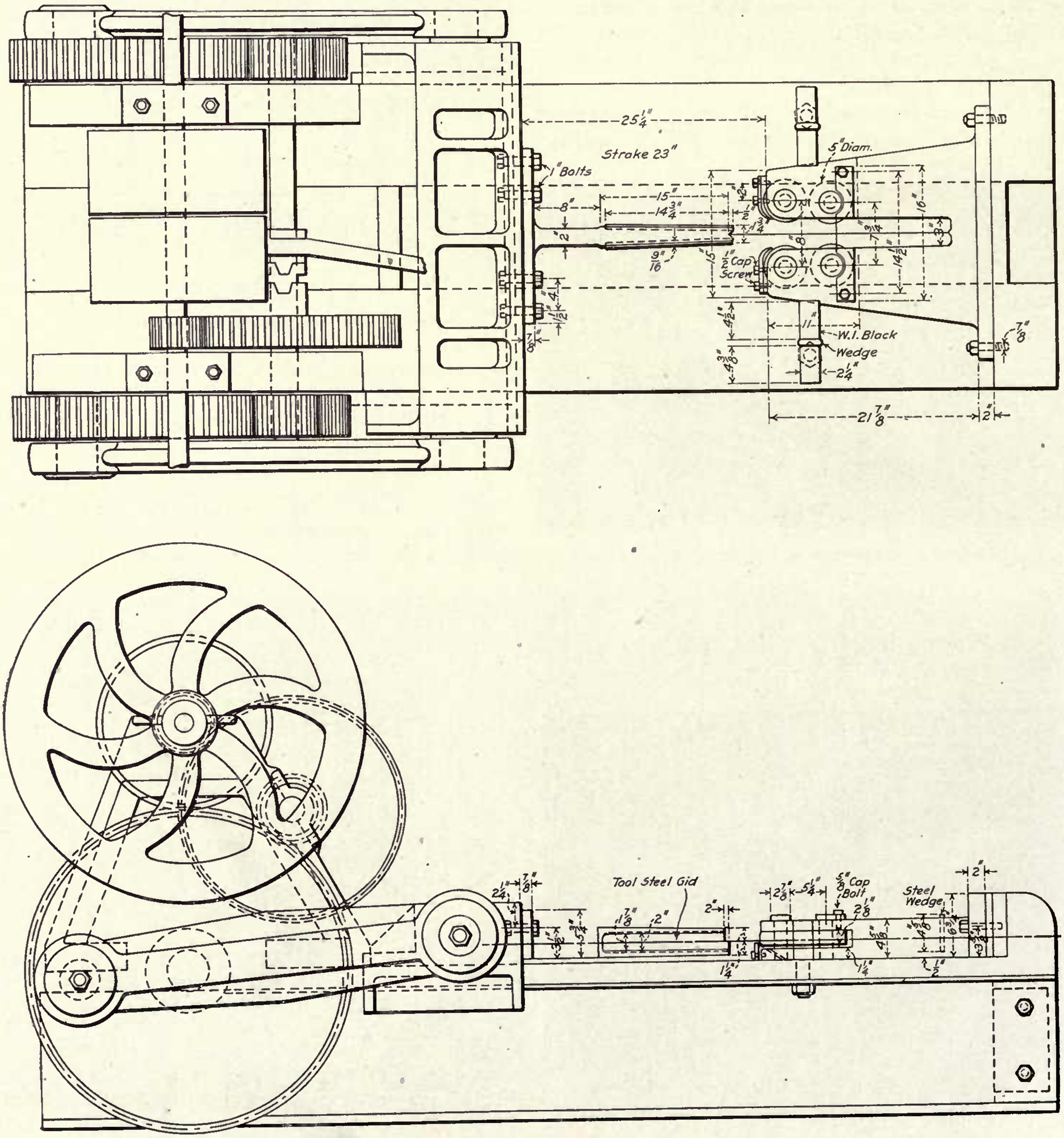



Fig. 702—Forging Brake-Shoe Keys on Bulldozer.

250 per day and at a cost of 16 cents each. By the use of the devices shown an output of 3,000 to 3,500 keys per day is maintained with the same labor at a cost of 1¼

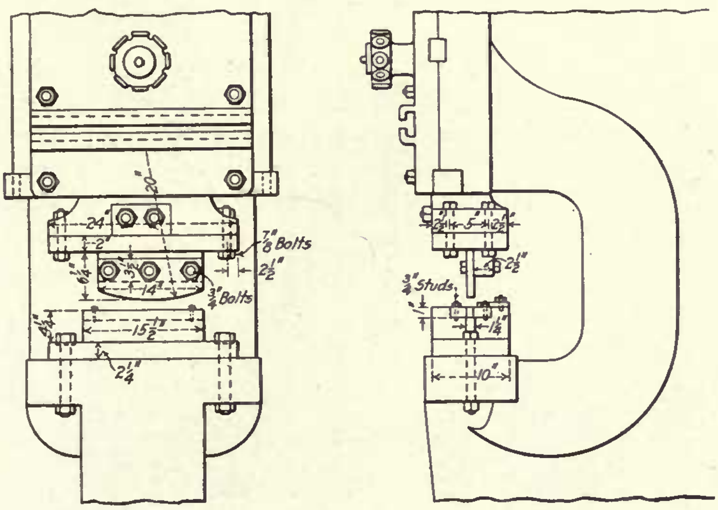


**Fig. 703—Device for Making Brake-Shoe Keys.**
As applied to power shears for shearing and bending the keys after forging.

cents per key. About 125,000 of these keys are made and used per year, so that comparing the cost of machine and hand methods, $18,418 is saved by the use of these devices.—*E. J. McKernan, Supervisor of Tools, Atchison, Topeka & Santa Fe, Topeka, Kan.*

CABOOSE STEPS, BENDING.

The law requiring the lowering of caboose steps has made it necessary to provide thousands of new brackets for these steps. A bulldozer at the Buffalo shops manufactures all of these for the system. The problem was to devise dies by which all the bends could be made in one heat and practically one operation. It was done by making two sets of dies, as shown in Fig. 704, and using a separate cylinder for operating each set. One die acts

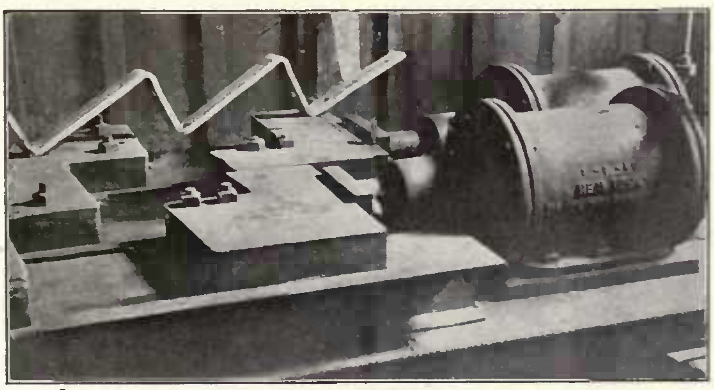


**Fig. 704—Bulldozer and Dies for Bending Caboose Steps.**

in advance of the other and completes its work before the other one starts to move. Ten-inch air brake cylinders are used. At present the bolt holes in the brackets are drilled after they are bent. Experiments are being made with a view to punching the holes in the ½-in. x 2-in. bar and bending it afterwards. This can, of course, only be successfully accomplished by heating the bars uniformly and to the same temperature and having the conditions of handling standardized.—*Erie Railroad, Buffalo, N. Y.*

CASTLE NUT DIES.

The dies shown at the right in the photograph, Fig. 705, are used for forming large castle nuts. The stock used is 2¼ in. round, and the completed nut is made in two operations and one heat. The plunger on top of

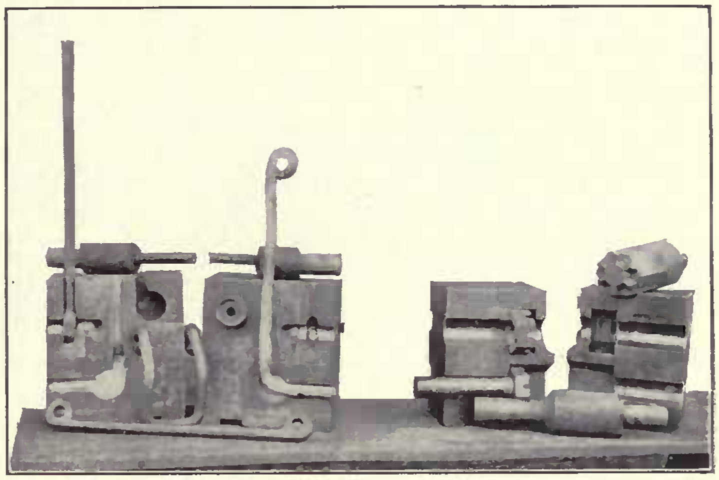


**Fig. 705—Dies for Upsetting and Punching Brake Hanger Ends and for Forging Castle Nuts.**

one of the dies is used first, with the stock placed in the lower impressions, as shown. This upsets the metal and forms the castle nut. The stock is then moved to the upper impressions and the round stock is punched away from the nut, there being no waste of material.—*Lehigh Valley, Sayre, Pa.*

COUPLERS, WELDING BROKEN STEEL.

Tools for welding lugs on broken cast steel couplers are illustrated in Fig. 706. This work is done on a steam

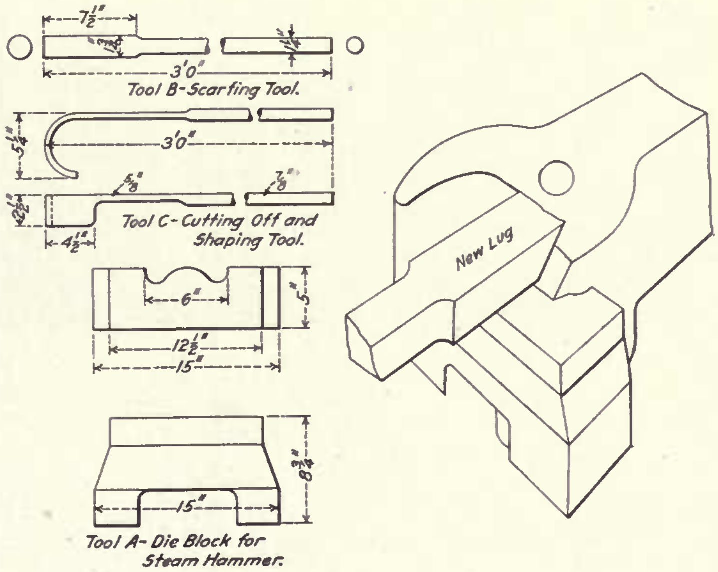



**Fig. 706—Welding Tools for Broken Steel Couplers.**

hammer successfully and profitably, from $6 to $8 being saved on every coupler repaired in this manner. Tool *A* is the bottom die block for the steam hammer. This block is shaped to fit the inside of the coupler between the knuckle pin lugs; scarfing, welding and cutting off is done on this block. Tool *B* is used for scarfing, and tool *C* for cutting off and shaping the new lugs. The perspective view shows a coupler and a new lug on the die block, scarfed and ready for welding. Sand or a welding compound should be used to insure a good weld. The work is simple and if properly handled no fitting is required to apply the knuckle, it being only necessary to drill the lug for the knuckle pin. Couplers have been repaired in this manner at the Columbus shops for the past two years and without a failure.—*E. G. Gross, Master Mechanic, Central of Georgia, Columbus, Ga.*

DRAWBAR YOKES, FORGING.

Dies for bending coupler yokes on a bulldozer are illustrated in Fig. 707. The stock, which has had the ends turned over, is placed between the dies, and as the crosshead moves forward the two wings are forced inward as they come in contact with the rollers on the short arms of the header. These rollers bear against steel friction plates. The 1-in. gibs on the bottom of the former fit in the bulldozer face plate slots and guide it. As the header of the machine moves backward, the two wings are drawn to their initial positions, as shown in Fig. 708. This arrangement makes it possible to bend yokes which are considerably longer than the stroke of the machine.—

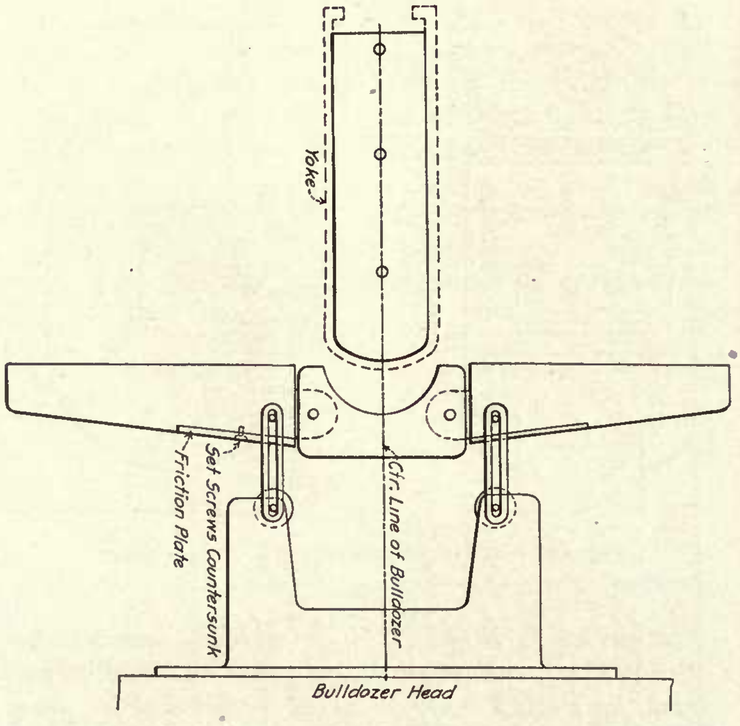



Fig. 708—Open Position of Dies for Bending Coupler Yokes.

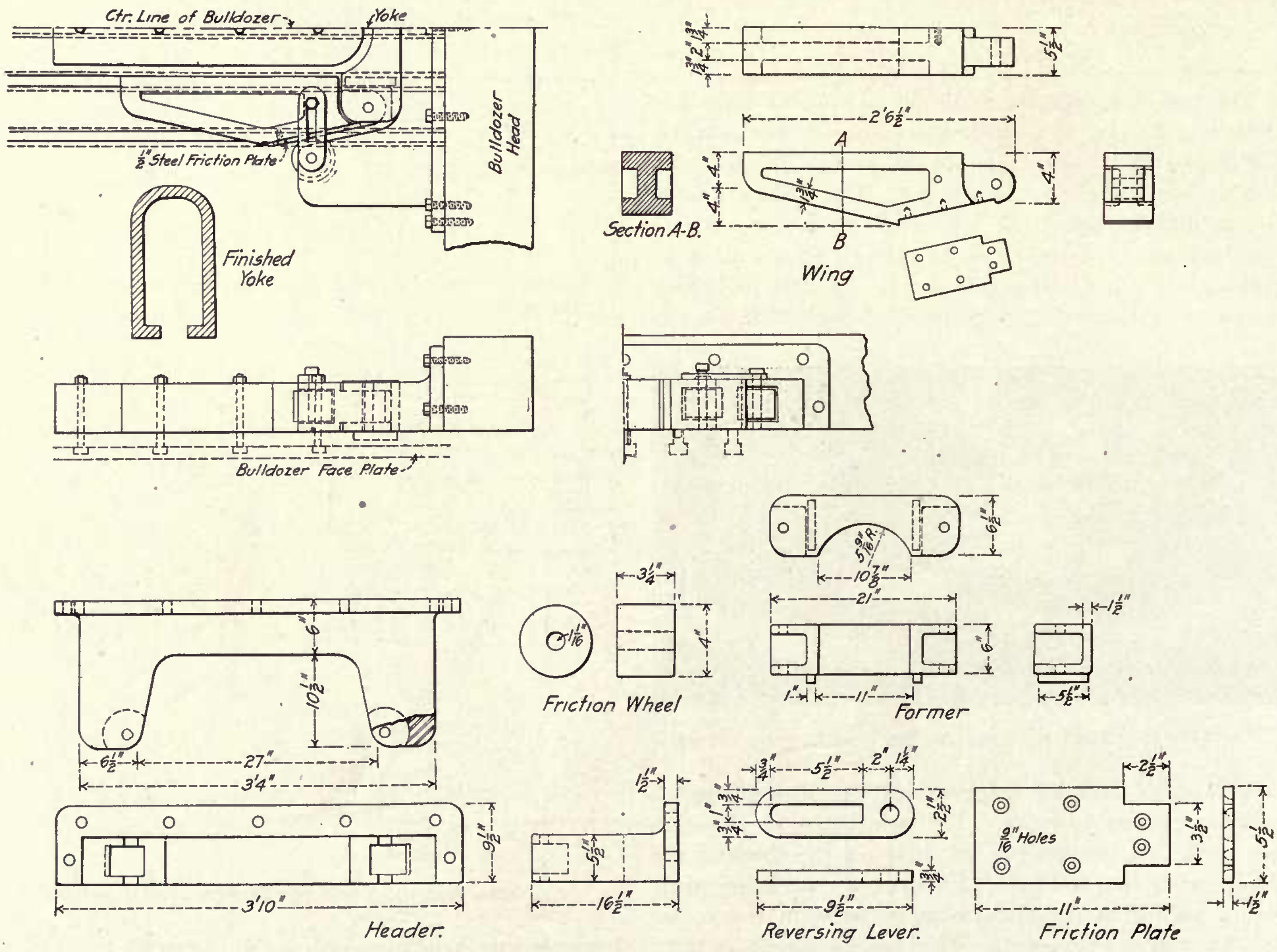



Fig. 707—Dies for Bending Coupler Yokes on Bulldozer.

*William H. Wolfgang, Draftsman, Wheeling & Lake Erie, Toledo, Ohio.*

DRAWBAR CARRY IRON, FORGING.

The tools for forging the two members of an ordinary drawbar carry iron under a steam hammer are shown in Fig. 709. The stock for the bottom member is first bent, as shown by the piece in the foreground in the center. It is then placed on the female former at the left and the block is driven down into place. The former has steel inserts at its outer top edges, and by placing the two strips on the ends of the iron, as shown, it may be cut off to the proper length by one blow of the hammer. The top member is formed by the dies shown at the right. Both the top and the bottom members of the support are finished at one heat. A set of these ready for drilling and application are shown near the center between the two sets of dies.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic; Harry Holder, General Foreman, and James Lynch, Blacksmith Shop Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

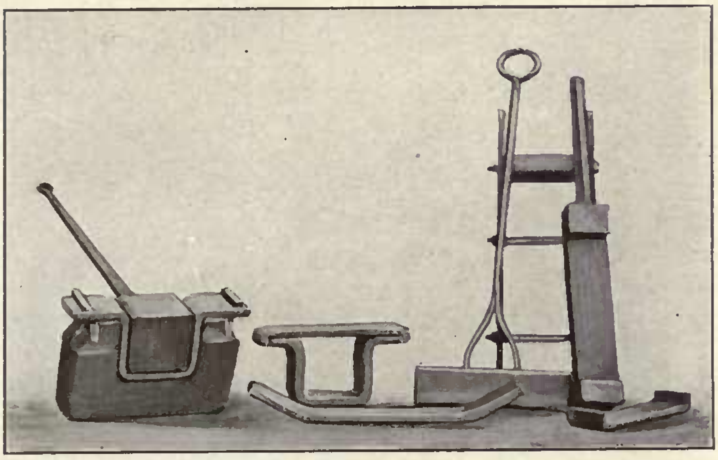


**Fig. 709—Tools for Forging Drawbar Carry Irons Under a Steam Hammer.**

DRAWBAR YOKES, BENDING AND PUNCHING.

An arrangement for bending and punching Miner draft rigging yokes made from 1-in. x 5-in. iron on an Ajax bulldozer is shown in Fig. 710. The shoulders on the open end of the yoke for gripping the coupler shank are upset on a forging machine, after which the center end plate hole is drilled or punched. After heating, the plate is placed on the bed of the machine, the end plate hole taking a pin in the end of the bending block, which is bolted in place. After bending, the yoke is inserted between the stripping plate and block shown for punching the four large holes. The yoke is then reversed for punching the four holes on the opposite side. The stripping plate is made loose, so that it acts as a straightener also, taking out the flare which is left after the bending operation, as the bending die is only about half the length of the yoke. The plan of utilizing each movement of the machine to full capacity is used in this process, since while one yoke is being bent by the bending dies another yoke can be punched at the same stroke. In order to avoid having the combined shock of the bending and punching come on the machine at the same time, the punching takes place near the end of the machine's stroke and after the bending shock has passed. The punches also vary ¼-in. in length, which serves to distribute these shocks. The capacity of the machine depends on the heating facilities. Under ordinary conditions it will handle 100 yokes per day.—*Geo. W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

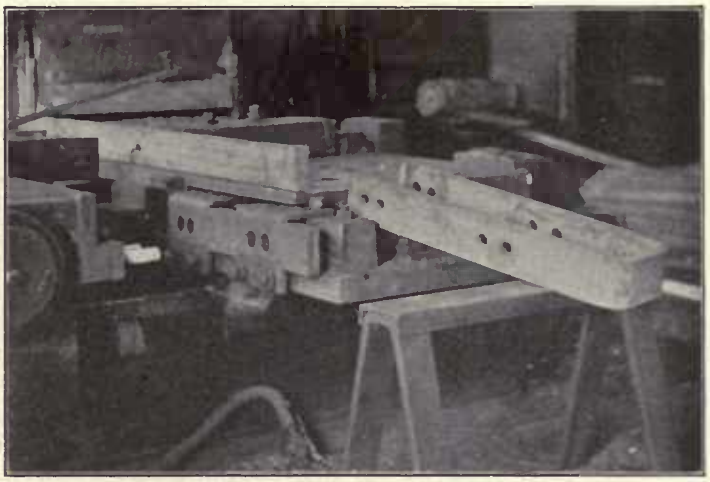


**Fig. 710—Bending and Punching Miner Draft Rigging Yokes.**

EYE BOLT DIES.

An interesting pair of dies with plungers for making eye bolts is shown in Fig. 711, together with a finished ⅞-in. eye-bolt. The dies, as well as the plungers, are made of soft steel. The upper impressions in the two die blocks with the plunger shown at the left, are used for the first stage, during which the collar is formed, while sufficient metal enters the end of the plunger to form the eye. The lower impressions, with the plunger shown at the right, finally shape the collar and also the boss which entered the first plunger. The central impressions are used without a plunger, their work being that of lateral action only in punching the eye hole. A film of metal, 1/16 in. thick, remains after this process, and is removed cold with a single blow of a hand hammer.—*Geo. W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

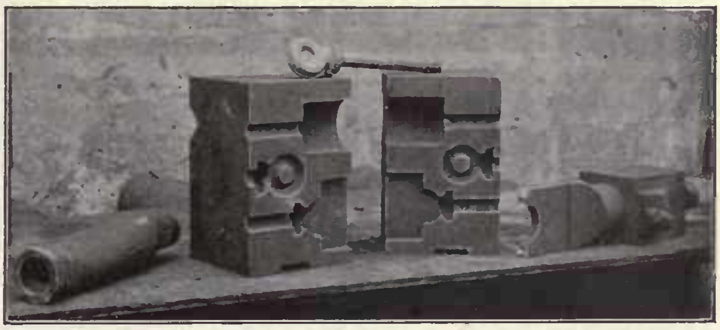


**Fig. 711—Eye-Bolt Dies.**

EYE-BOLT, TOOL FOR BENDING.

A tool for bending eye-bolts on a small bulldozer or air press is shown in Fig. 712. The head *A* is attached to the plunger of the machine, and to it are pivoted the two arms, *BB*. At the outer ends of these arms are pins that move in and are guided by the slots *CC* in the anvil or former. The round iron to be bent is laid across the

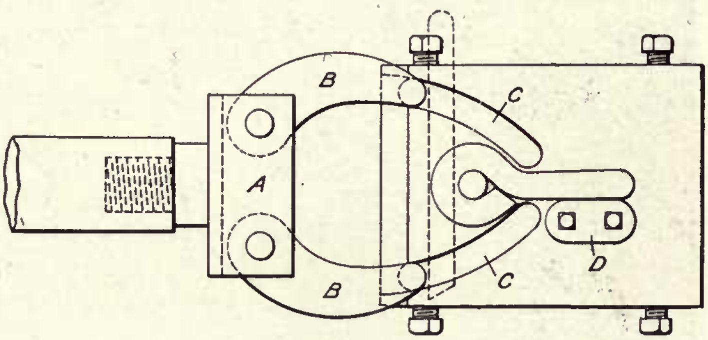



**Fig. 712—Tool for Bending Eye-Bolts.**

anvil and against the pin, as indicated by the dotted lines. The head is then pushed down, and the arms guided by the slots, *CC*, bend the round bar in front of them until the long end strikes the stop, *D*. The upper arm then necks it in and the short end is bent around the pin to form the head of the eye.—*J. F. Perritt, Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.*

HOOK, DIES FOR BENDING.

A bending machine for forming coal gate hooks is shown in Figs. 713 and 714. The female die is carried

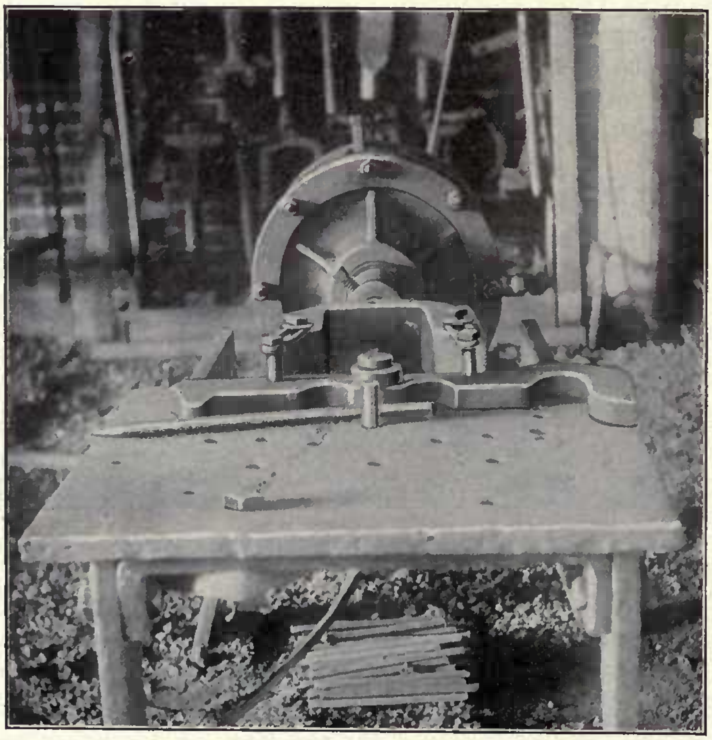


**Fig. 713—Material in Position Ready to Bend Coal Gate Hook.**

by the piston rod of the 12-in. x 14-in. cylinder, and the two dies which form the hook revolve about the heavy pin in the table. A few inches from the pin on which these formers revolve is another pin in the bed plate. Fig. 713 shows the dies open and the piece of round iron, pointed on one end and slightly bent at the other, in

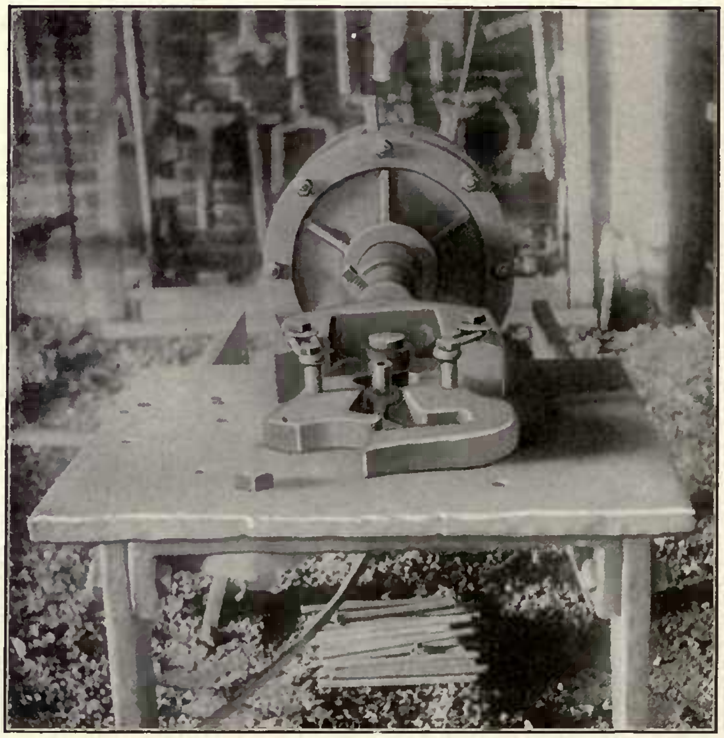


**Fig. 714—Dies After Coal Gate Hook Has Been Formed.**

position. Fig. 714 shows the dies opened slightly after the hook is bent. The metal loops serve to draw the dies open as the female die recedes. This machine is a great labor saver, turning out from 30 to 40 hooks per hour.—*F. J. Cook, Foreman, Car Department Smith Shop, St. Louis Southwestern, Pine Bluff, Ark.*

PEDESTAL STRAP BRACE.

An object lesson in the flow of metal during a die forging process is well illustrated in Fig. 715. This

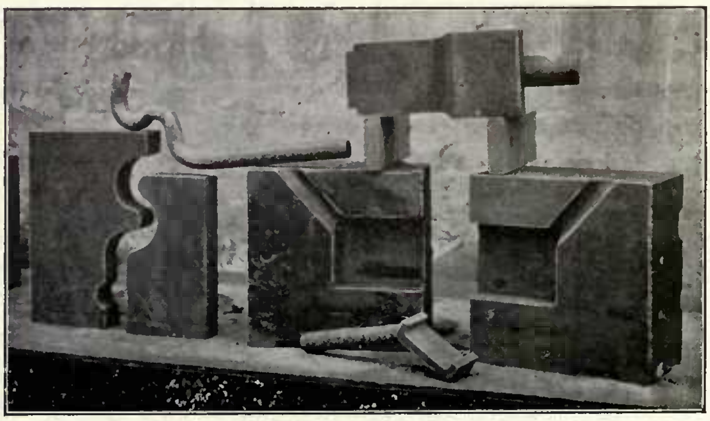


**Fig. 715—Foot Forming Dies.**

forging, made from 1¼-in. round iron, is used for the lower foot of a passenger car pedestal strap brace, but the same general shape is used in a variety of instances, both in car and locomotive work. The bending dies, shown at the left, are used in forming the round iron into the shape shown. These dies are clamped on top of the main dies, the half circular section of the lower portion of the extreme left-hand die being made to clear the oblique circular impression in the main die. This three-bend shape resulted from a series of trial shapes, it being probably easier to get it in this way than by calculation of the metal flow. After this preliminary shape is made, the metal is returned to the furnace for a welding heat and is made into the final shape by means of the dies shown at the right.—*Geo. W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

SAFETY CHAIN EYE.

A pair of dies used for making safety chain eyes for passenger cars is shown at the left in Fig. 716. A finished eye is also shown. The stock, ¾-in. x 2½-in., is first heated in a furnace and given the 90-deg. twist. After the second heat, the stock is upset and formed in the lower impressions, taking the shape shown. This

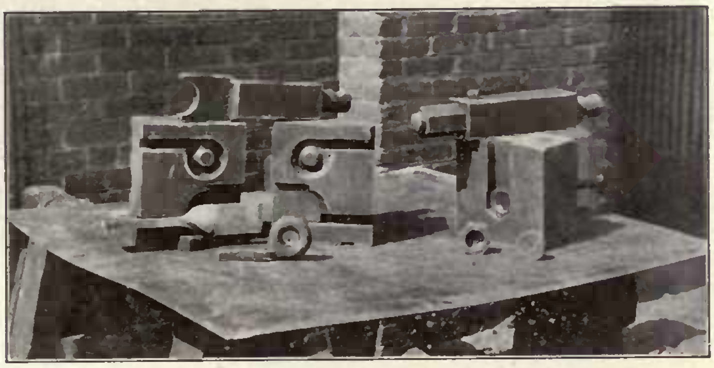


**Fig. 716—Safety Chain Hanger and Flexible Staybolt Sleeve Cap Dies.**

same heat is sufficient for the final operation, that of giving the circular form to the loop. A thin film of metal remains after this operation, which is afterward punched out with a pin.

FLEXIBLE STAYBOLT SLEEVE CAP.

A die for making caps for flexible staybolt sleeves is shown at the right in Fig. 716. This cap is made in one heat, from 2¼-in. diameter punchings of ¾-in scrap. But one blow of the plunger is required; the stock is dropped in from the top and the finished forging is kicked out by a hammer blow on the ram shown at the back of the die. A man can make 800 of these caps per day of 10 hours.—*Long Island Railroad, Morris Park Shops.*

SILL STEP BENDING DIES.

Two views of a set of dies used on an Ajax bulldozer for forming sill steps are shown in the photos, Figs. 717 and 718. Fig. 717 shows the dies open after having formed the step. By reference to Fig. 718 it may be seen that the jaws of the female die are wider than the male die—plus twice the thickness of the metal as is usually the case. The female die bends the iron by carrying the two arms from their position in Fig. 717 to that shown

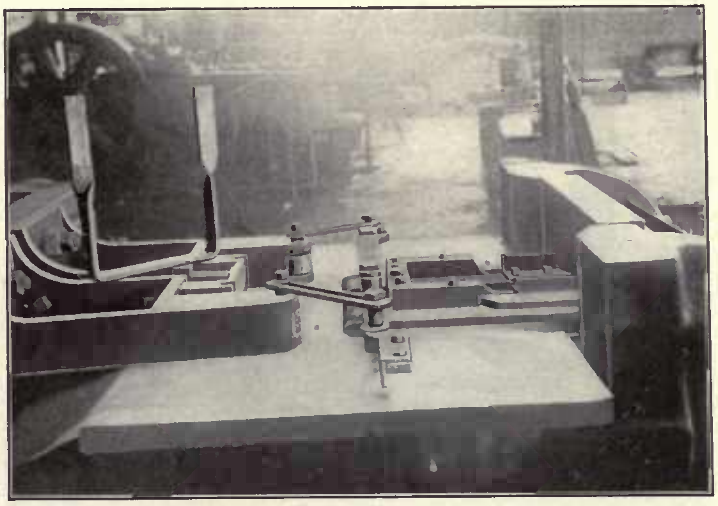


**Fig. 717—Dies in an Open Position.**

in Fig. 718. The twist of the ends is made at the same time. The two metal loops serve to bring the swinging arms back to position for another stroke. This machine will bend from 40 to 50 sill steps per hour, making one at each revolution of the machine.—*F. J. Cook, Foreman, Car Department Smith Shop, St. Louis Southwestern, Pine Bluff, Ark.*

SPRING SEAT STIRRUPS, BENDING.

Spring seat stirrups for freight car trucks are formed on an Ajax bulldozer with the dies shown in position in Fig. 719, and in detail in Fig. 720. The male die is bolted to the face plate and rests against the end stop of the machine, while the female die is bolted to the mov-

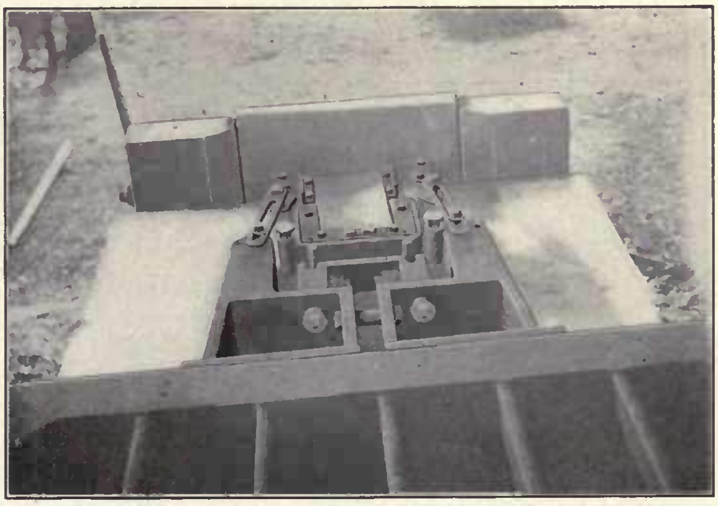


**Fig. 718—Dies Opening Up After the Step Has Been Formed.**

able head. The holes in the stirrups are first drilled and countersunk, after which the plate, 1-in. x 6-in., is placed in the furnace. The photo shows one of these plates in position just before bending. The small drilled hole in the center of the plate takes a pin on the male die. Making these stirrups on this machine presented a problem which was met in a decidedly novel way, and at the same time added a feature to the dies which very materially assists the metal in taking the new form. This problem

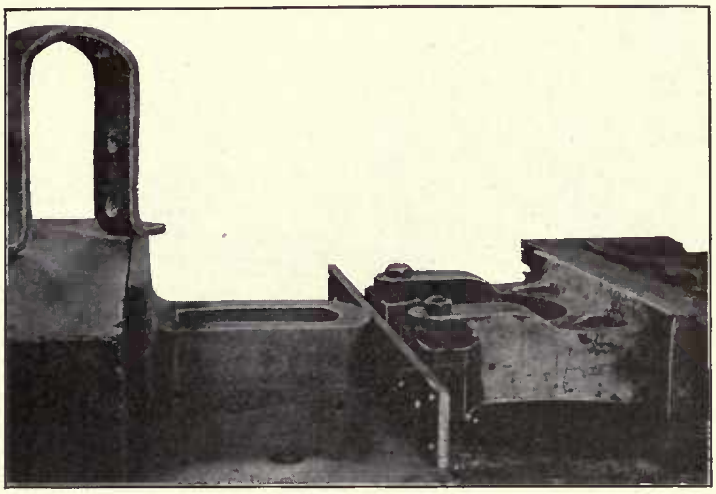


Fig. 719—Dies for Bending Spring Seat Stirrups.

lay in the fact that the travel of the machine was about 3 in. less than the length of the finished stirrup. The drawing shows the two extreme positions of the movable blocks which were placed on the ends of the female die.

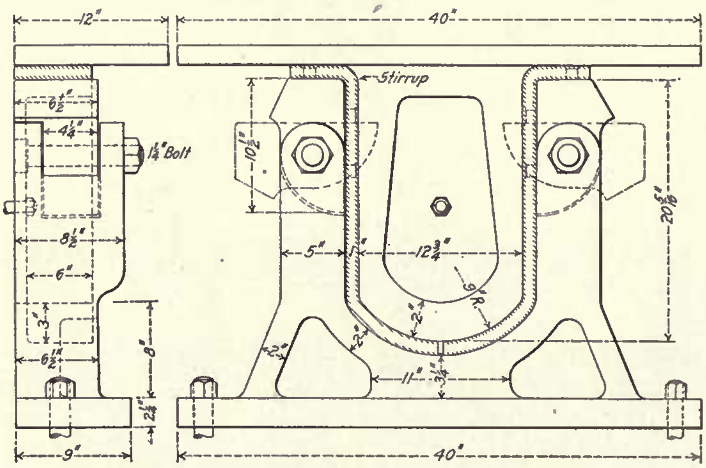



Fig. 720—Spring Seat Stirrup Dies.

The dotted lines show the positions which these blocks assume at the beginning of the operation, while the full lines show their final position. As the dies close together, these blocks revolve on the 1¼-in. pins, and the flat surfaces of the blocks present two 10½-in. movable surfaces to bend the iron, which is an advantage over the metal's bending against the solid corners of the die.—*Geo. W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

UNCOUPLING ROD, BENDING.

Dies for bending uncoupling rods on an Ajax bulldozer are shown in Fig. 721. This attachment operates on two uncoupling rods at the same time, the four center bends being made as indicated by the partially completed rod on the face plate and extending around the die block,

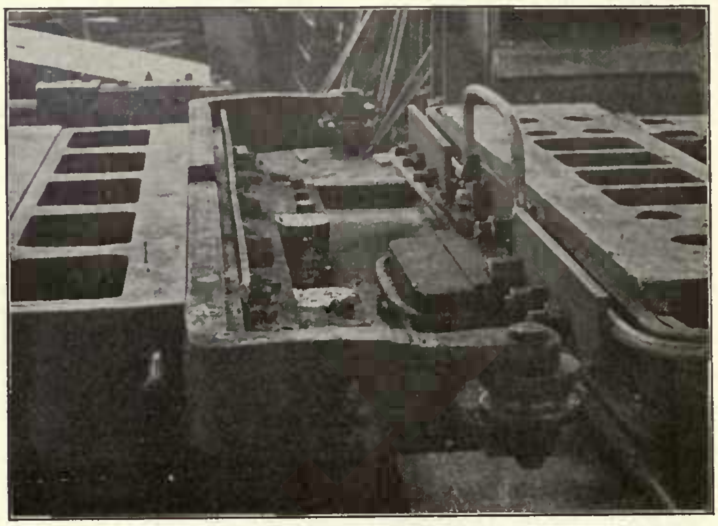


Fig. 721—Bending Uncoupling Rods.

while the two end bends are made as indicated by the completed rod shown near the top of the stationary block of the machine. These rods are made of 1-in. round iron and are bent cold. All bends are made against grooved rolls, and the cold metal takes the new form much more easily than it would were these grooves rigid, in which case considerable friction would result. The rod which is taken from the lower position and moved to the upper for the final bends is not rigidly clamped in position, but merely placed along the space blocks. When the rolls meet the round iron, they hold it firmly in position.—*Geo. W. Kelly, Foreman Blacksmith, Central Railroad of New Jersey, Elizabethport, N. J.*

# Air Brake Kinks

AIR HOSE FITTING MACHINE.

A complete outfit for handling the air hose used on locomotives and cars is shown in Fig. 722. Without exception, we think we can handle and equip more hose than any other railway shop in the country. We have a chute on one end of the bench. The hose are cut to proper lengths when they are received. The two clamp rings are slipped over the hose, which are then put on the chute and roll down to the operator at section *I-J*. He puts the coupling and the nipple in the carrying arms; with his foot he operates the air connection and the nipple and coupling are pressed in the hose at the same time. The hose is then transferred to another chute and to the air clamps shown in *C-D*. These tighten the clamps, while the operator turns the clamp screws by means of a flexible shaft. The hose pass through section *I-J* at the rate of 300 per hour; that is, putting on 300 couplings and 300 nipples, or a total of 600 ends per hour. We also have a knife arranged with an air cylinder by which we cut old hose to strip the connections. The hose can be cut and connections taken out just as fast as the operator can handle them.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

AIR HOSE FITTING MACHINE.

Compressed air is now almost universally used for applying couplings and nipples to hose. There are many designs of machines used for this purpose, one of which is shown in Fig. 723. It consists mainly of three cylinders, *A*, *B* and *C*, mounted on a bench. The *A* cylinder is vertical and contains a piston whose rod is attached to the upper part of the hose clamp *D*. The cylinder *A*, made of a piece of 4½-in. pipe, has a spring which tends to maintain the piston in its upper position. The piston rods of the two end cylinders *B* and *C* carry holders that take the nipple and coupling respectively. The hose is placed between the clamps and the air is admitted to the vertical cylinder. The clamps are 20 in. long, with a clamping surface of 14 in. A flare at the ends allows for

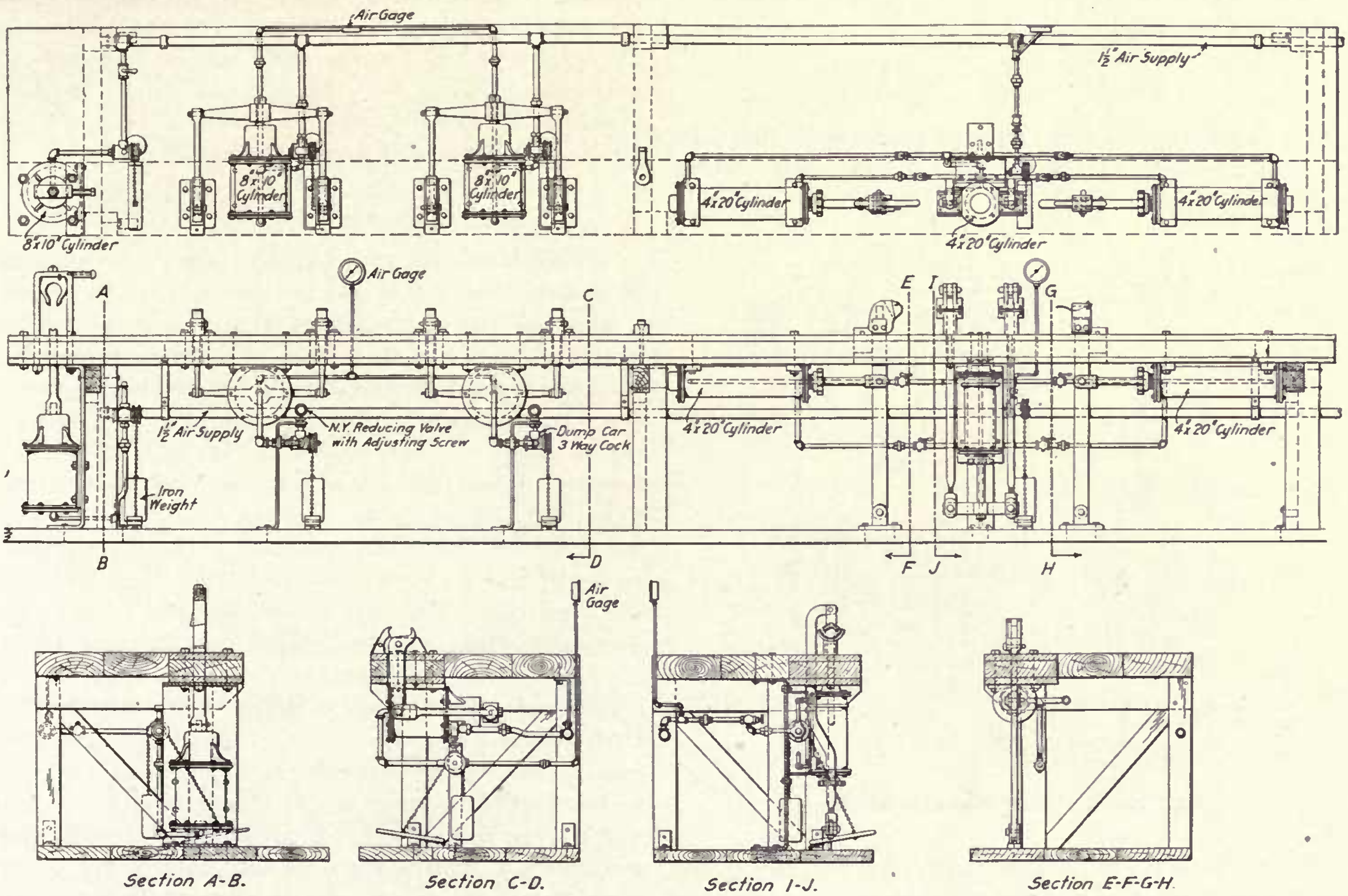



**Fig. 722—Bench Equipment for Fitting Up Air Hose.**

the increase in the hose diameter, due to the insertion of the metal pieces. Air is then admitted to cylinder *C* and and forcing in the nipple at the same time. The horizontal cylinder is also equipped with a wedge, shown in two

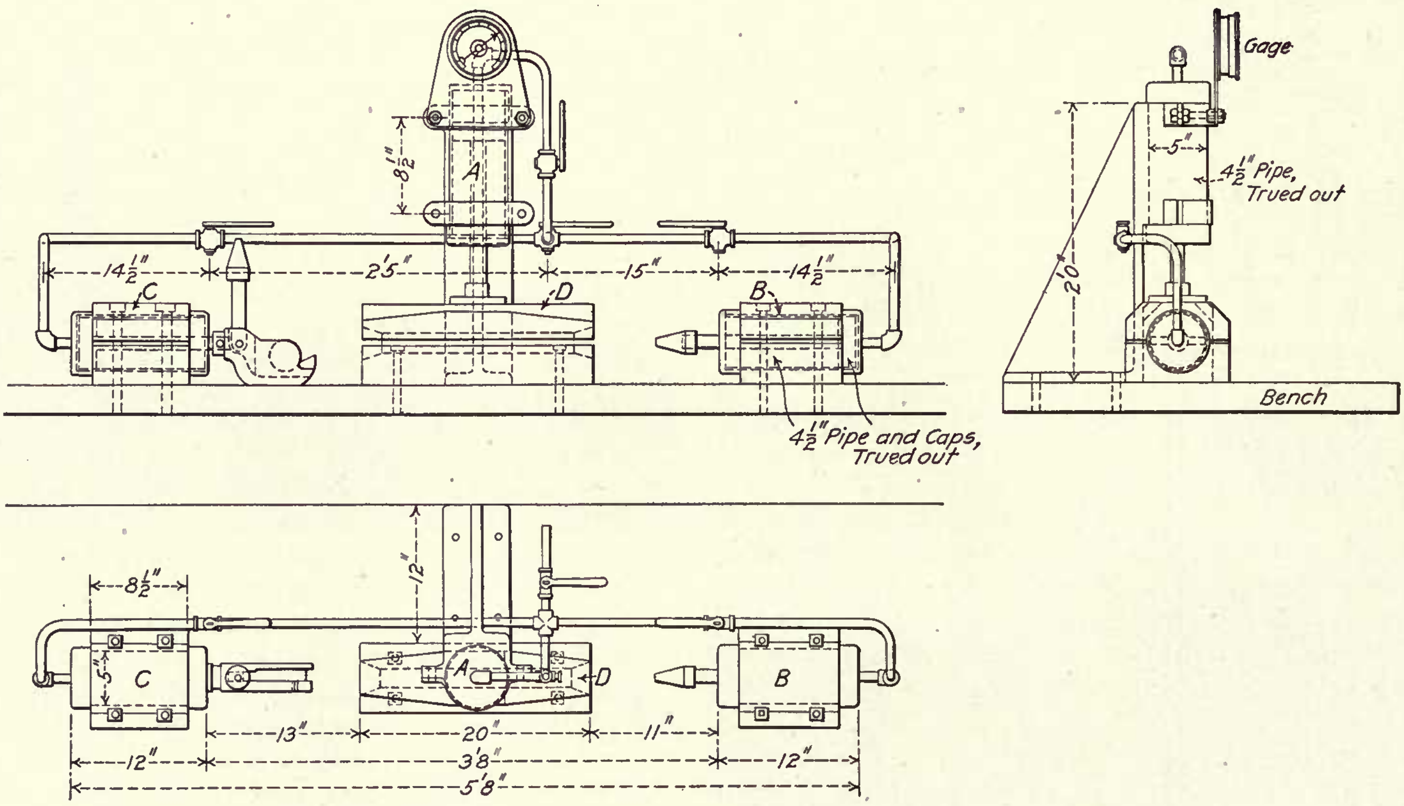



**Fig. 723—Machine for Fitting Coupling and Nipple on Air Hose.**

*D* forcing the coupling and nipple into the hose.—*Southern Railway.*

#### AIR HOSE MOUNTING MACHINE.

An outfit for mounting air hose is shown in Fig. 724. The two cylinders are set at right angles. The vertical one operates the clamp *C*, by which the hose is firmly

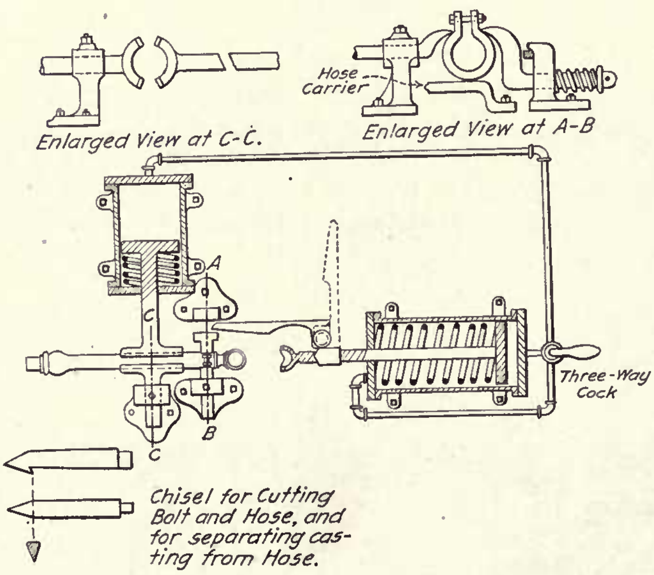



**Fig. 724—Air Hose Mounting Machine.**

held in position, and the horizontal cylinder holds the nipple or coupling at the end of the piston rod. A single cock admits air to both cylinders, thus clamping the hose positions, with which the clamp may be tightened after the nipple is pressed in the hose. The chisel, shown at the bottom of the drawing, may also be used with the horizontal cylinder for stripping the fittings from old hose.—*F. C. Pickard, Assistant Master Mechanic, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

#### AIR HOSE STRIPPING MACHINE.

The apparatus for stripping the fittings from air brake and steam hose shown in Figs. 725 and 726 has caused a saving in time of from 60 to 70 per cent., and a saving in air hose clamps of from 20 to 30 per cent., as compared with the methods formerly used. By means of the air hose clamp bolt cutting machine shown in Fig. 725, and the stripping machine shown in Fig. 726, an ordinary laborer can cut the bolts and remove and assort all the fittings for 100 air brake hose per hour, and this without injury to the fittings. We have stripped about 45,000 air brake and air signal hose and 2,000 steam hose with this apparatus, which was constructed about a year ago. The bolts which hold the clamps are first cut on the machine which is illustrated in detail in Fig. 725. It consists of an old 10-in. passenger car brake cylinder fitted with a plain head. Air is admitted to the upper end of the cylinder through the ¾-in. three-way cock, to the handle of which a coil spring is attached from above. The spring, which is not shown on the drawing, automatically returns the three-way cock to the release position as soon as pressure is removed from the foot lever. The standard brake cylinder piston release spring returns the piston to its upper position after each stroke. The stroke is limited to 2 in. by the oak filling block which is 9¾ in. in diameter and 10 in. long, with a 6-in. hole

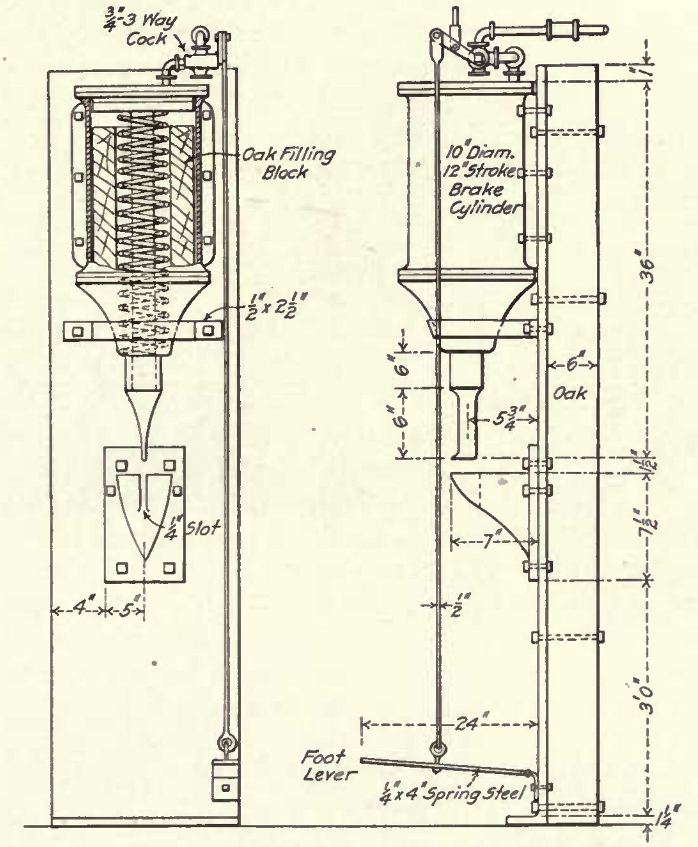



**Fig. 725—Air Operated Machine for Cutting Air Hose Clamp Bolts.**

through the center for the piston rod and the release spring. The frame which supports the device consists of two old 1¼-in. by 5 in. arch bars, which are backed up by two pieces of oak, 6 in. square in section. The upper part or shank of the chisel which cuts the bolts fits over the end of the piston rod and is held in position by a ⅝-in. set screw, which is not shown.

After the clamp bolts have been cut, the hose is placed in the stripping machine, shown in Fig. 726. By operating the three-way cock air is admitted to all three of the air cylinders at the same time. The end of the piston rod of the air cylinder underneath the table is connected to a lever which operates the clamps that grasp the hose firmly near its center. At the same time the pistons of the two cylinders at either end of the top of the table move outward, pulling off the air hose coupling, nipple and clamps. The three-way cock is then placed in the release position and the pistons of all three cylinders are forced to their normal positions by means of the ordinary brake cylinder piston release springs. A filling block 4 in. thick has been placed in each of the two top cylinders to shorten the stroke; the blocks are cut out at the center to make room for the piston rod and release springs. The two top cylinders are old 8-in. freight car brake cylinders and have been fitted with plain heads on both ends, one head being fitted with a stuffing box to allow the 1¾-in. piston rod to pass through it. The outer end of the piston rod is threaded for a distance of 2 in. to take the heads which fit over the hose coupling and nipple.—*Frank J. Borer, Foreman Air Brake Department, Central Railroad of New Jersey, Elizabethport, N. J.*

### AIR HOSE STRIPPING MACHINE.

A compact arrangement for stripping the fittings from air brake hose is shown in Fig. 727. The machine is operated by the foot valve *B*, which admits air to an 8-in.

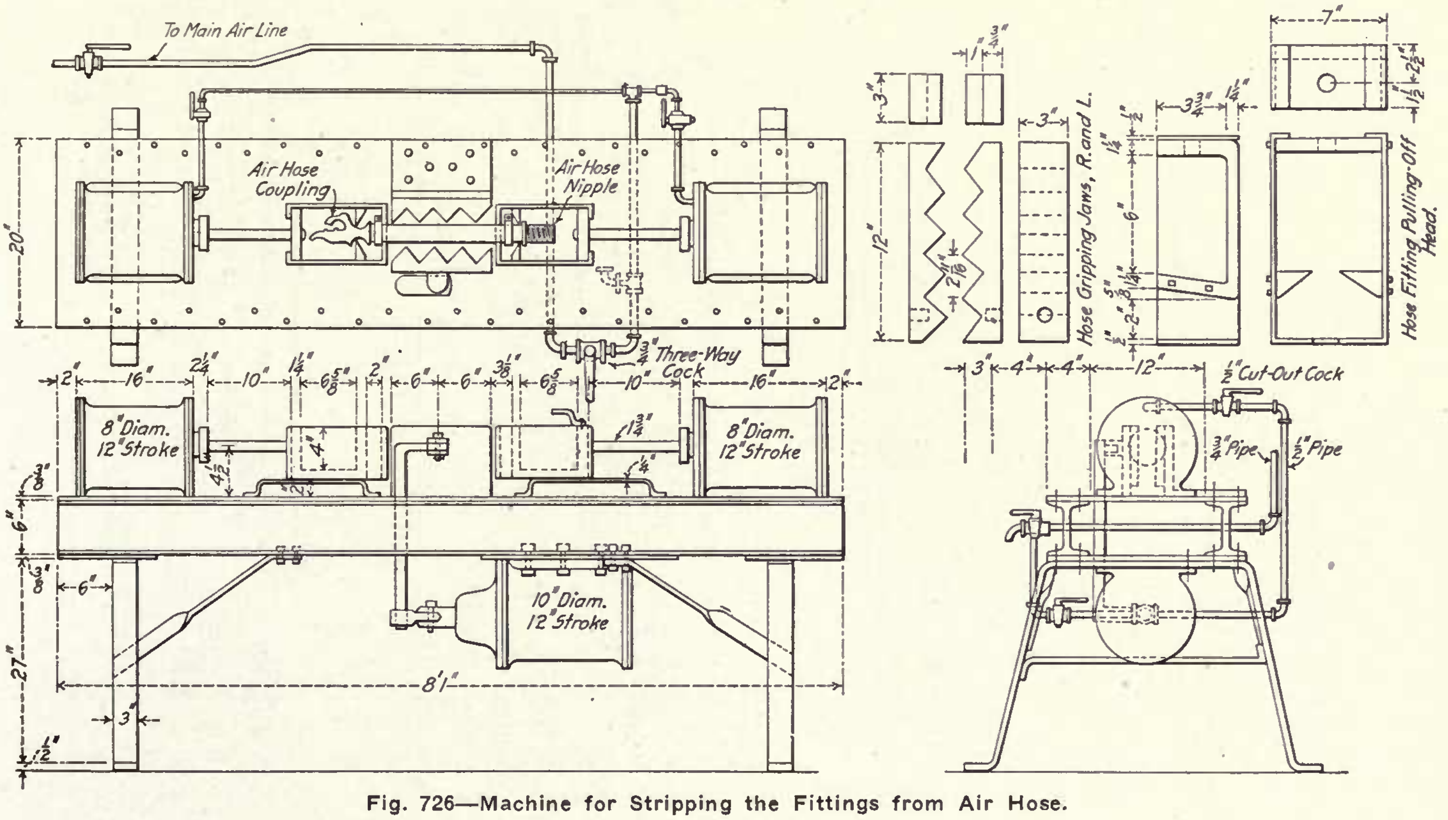



**Fig. 726—Machine for Stripping the Fittings from Air Hose.**

by 12-in. cylinder. The piston rod has fastened to its upper end a forked member *C*, which rises when air is admitted to the cylinder. In the first operation this end *C* forces the knife *A* over, cutting the clamp bolts so that the clamps may be removed. The piston is then allowed to return to its normal position. In the second operation the forked end when rising, closes the movable clamps *F* which work on the guides *H*. The inside faces of these clamps are fitted with checkered plates so as to firmly grasp the hose. Each clamp also has two studs *G*, at the ends of which are coil springs for the purpose of drawing the clamps back after the air pressure has been released. The links *J* and *K*, and the bell cranks *L* operate the stripping blocks *M*. To one of these blocks is attached fitting *N* to catch the hose coupling, and to the other fitting *E* to catch the nipple. These stripping blocks move along the top face of the machine, using the inside flanges of the I beams, which form the bed of the machine, as guides. At the end of each stripping block is a rod *P* which holds a piece of air hose that acts as a buffer and takes up the horizontal shock when the hose is stripped. There is a heavy coil spring in the cylinder to absorb the vertical shock at the moment the stripping takes place. When operating the machine the workman, after removing the clamps, places the hose so that the fittings catch in their respective holding devices. He then operates the foot valve, admitting air and raising the piston. The clamps grasp the hose and the fittings are drawn from it; they drop into a chute and fall to the floor. The foot valve is then released, exhausting the air from the cylinder and allowing the hose to be taken from the machine. This machine does not require skilled labor, but is comparatively easy to operate.—*R. G. Bennett, Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

### AIR HOSE STRIPPING MACHINE.

A device for cutting the clamp bolt and removing the fitting from one end of a torn air brake hose is shown in Fig. 728. By means of an 8-in. air brake cylinder and a system of levers, the operator, by pressing a foot-valve, may cut the clamp bolt with the knife *A* at the left of the machine. After removing the clamp lay the end with the fitting horizontally on top of the jaws and again press the foot-valve. The plunger *B* will force the piece down through the jaws tearing the hose from the fitting. The knife *A* is driven by a cam attached to the frame of the machine. This machine has been found to be a valuable addition to an air brake hose department.—*R. G. Bennett,*

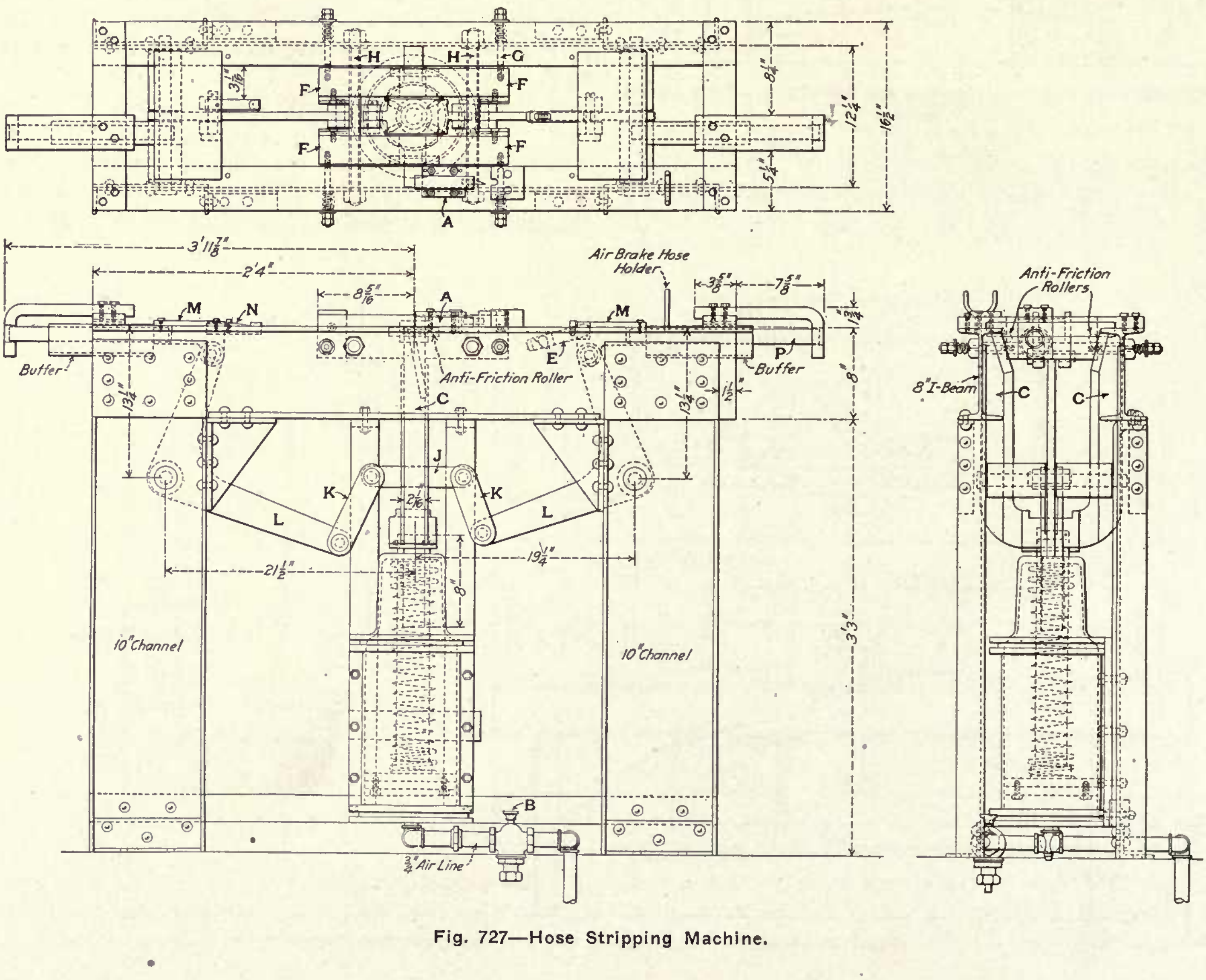



Fig. 727—Hose Stripping Machine.

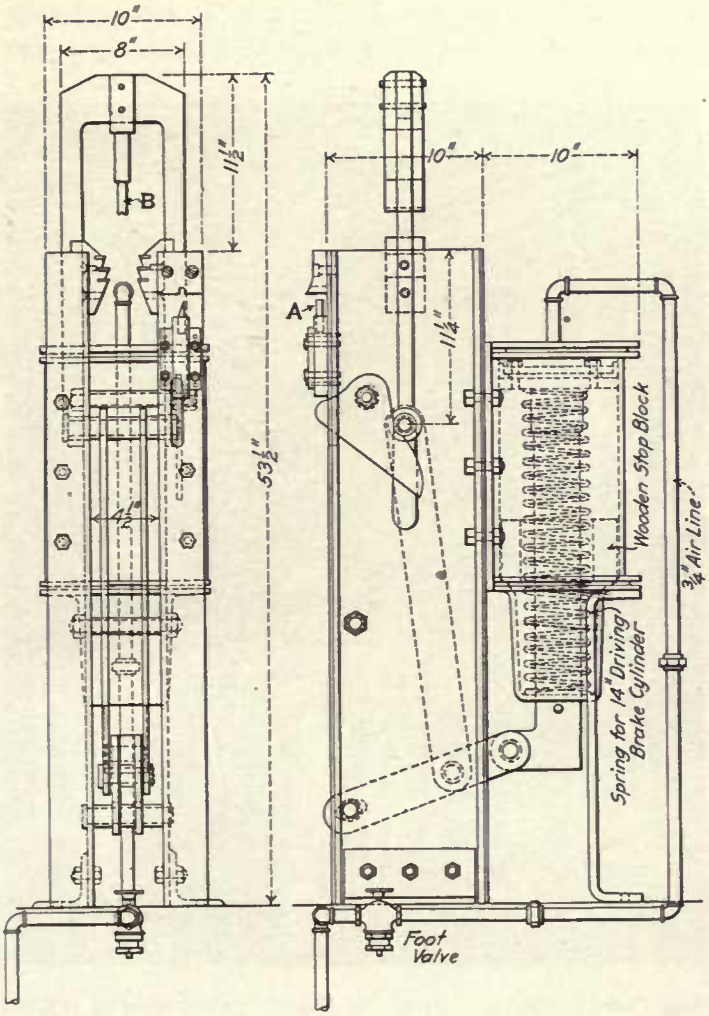



Fig. 728—Stripping Machine for Torn Air Brake Hose.

*Motive Power Inspector, Pennsylvania Railroad, Pittsburgh, Pa.*

### AIR PUMP BUSHING, BORING.

A handy tool for boring and turning air pump bushings is shown in Fig. 729. It is so arranged that two cutting tools, ¾ square, both cut at the same time. One tool turns the outside while the other tool bores the inside. Both tools may also be used for boring a cylinder by turning one tool upside down and reversing the tools

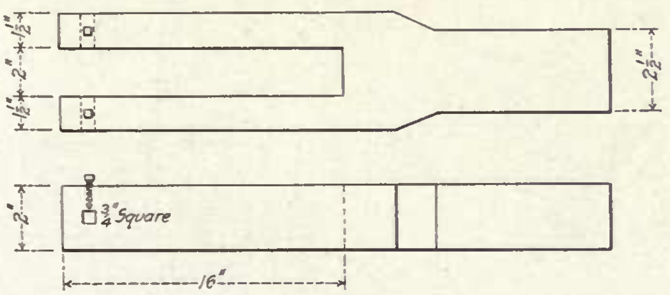



Fig. 729—Boring Tool for Bushings.

so that they both face out from the holder. When used in this way two cuts are taken on the inside at the same time. While the tool is intended for machining air pump bushings, it may be made any size to suit other work.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

### AIR HOSE, TIGHTENING CLAMPS ON.

A device for tightening the clamps on air brake hose while they are being bolted or locked, as the case may be, is shown in Fig. 730. An 8-in. air brake cylinder fur-

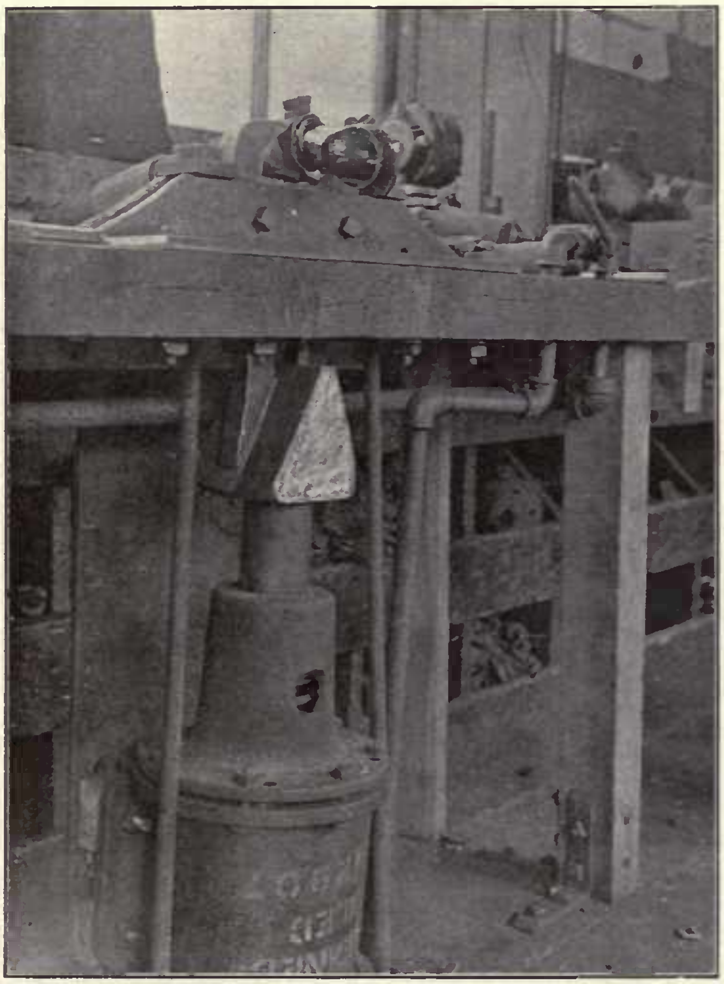


Fig. 730—Device for Tightening Clamps on Air Brake Hose.

nishes the power. A spring is to be applied near the lower ends of the two levers to force the clamp open when the wedge is withdrawn.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

### AIR PUMP CENTERING CHUCK.

The chuck for centering air pumps, shown in Fig. 731, is intended to overcome the difficulty of chucking them

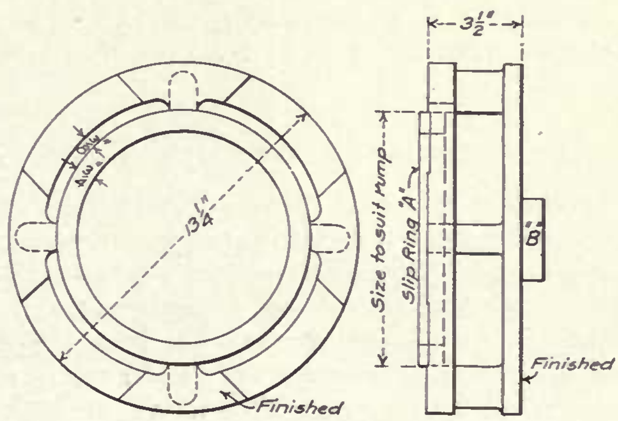



Fig. 731—Air Pump Centering Chuck.

for reboring. The outside diameter of the slip ring *A* is a sliding fit in the counterbore of the air pump. The boss *B* fits neatly in a hole in the center of the boring mill table. The pump is placed on the stand and the slip ring is pushed up into the counterbore. The pump is then clamped down to the boring mill table and the slip ring is pushed far enough out of the way to permit of boring the cylinder. This device saves about 15 minutes in reboring each pump cylinder.—*Chicago, Milwaukee & St. Paul, West Milwaukee, Wis.*

### AIR PUMP CYLINDER HEAD CHUCK.

An air pump top cylinder head, chucked in position for boring out the bushing in the main valve chamber is shown in Fig. 732. It is difficult to rebore these bushings without some special design of chuck and the one shown is simple and effective. The chuck is made of cast iron and consists of two disks and two space pieces, all cast in one piece. One of the disks is threaded for screwing on the faceplate, while the other is provided with bolt holes for securing the cylinder head by means of bolts through the valve chamber flanges. This arrangement assures perfect alinement of the bored bushing, as the joint surface forms the bearing against the plate of the chuck.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

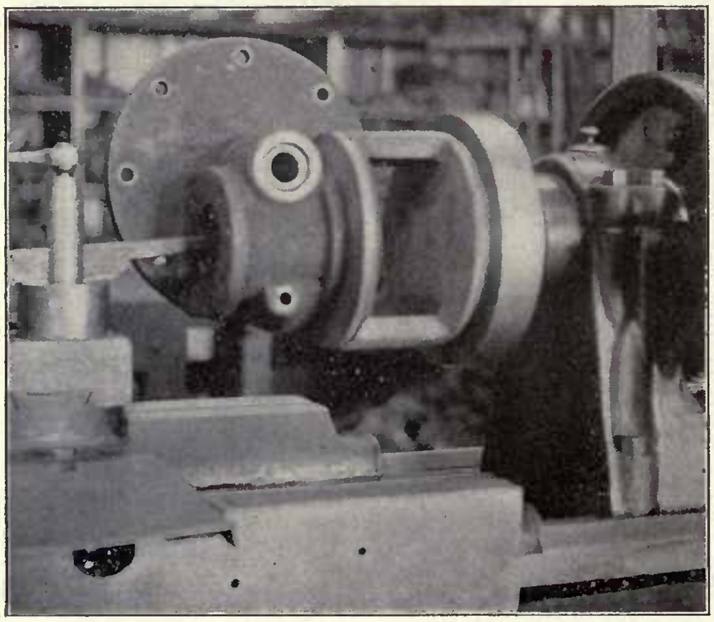


**Fig. 732—Air Pump Cylinder Head Chuck.**

### AIR PUMP CYLINDERS AND STEAM CHESTS, DRILLING.

A method of boring air pump cylinders which saves taking them apart, as is sometimes necessary when they are bored out in a lathe or boring mill, is shown in Figs. 733 and 734. It insures a bore perfectly true with the cylinder head bore, as reference to the drawing will show. The guide bracket *A* is bolted to the cylinder casting after the spindle has been centered. The tools *C* are adjusted by the screws *D*. The boring bar is made with a standard Morse taper shank and is driven by a universal drill. The lower end of the boring bar is held central by a split

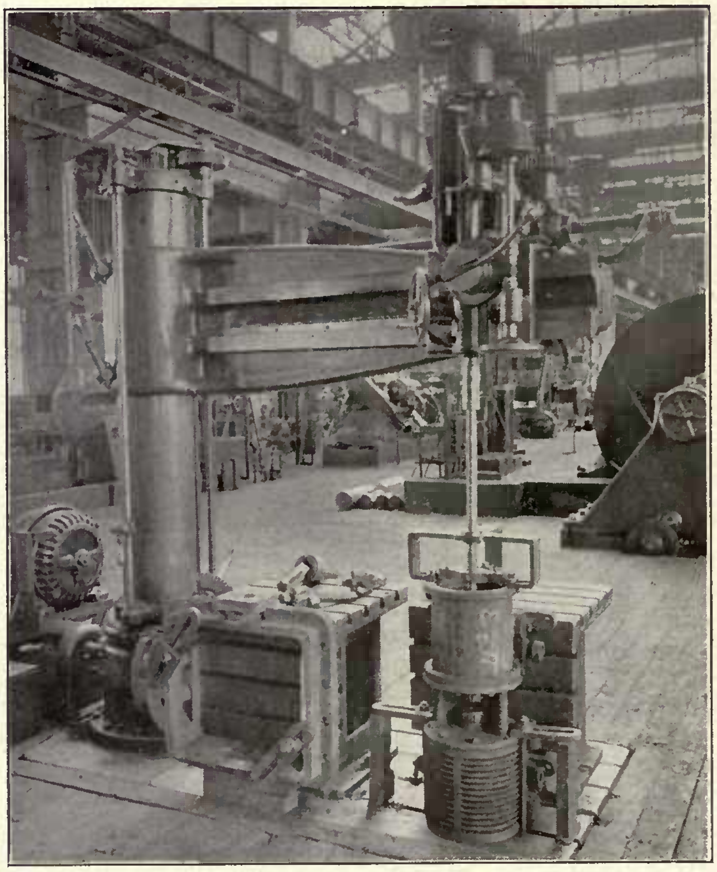


**Fig. 733—Tools for Boring Air Pump Cylinders and Steam Chests.**

bushing made slightly tapering on the outside to fit the stuffing box gland of the pump.

To the left of the air pump in Fig. 733 is shown a

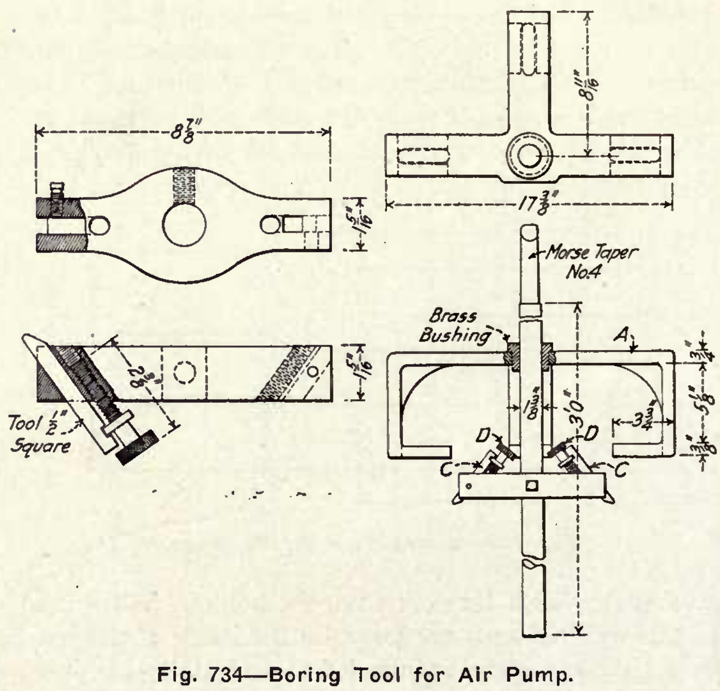



**Fig. 734—Boring Tool for Air Pump.**

steam chest which is ready for boring. It was formerly the practice to cast the steam chest with this hole cored and to finish it on a horizontal boring mill, but considerable time was often lost, due to the core having been placed off the center or because of the holes being filled with sand. By making the part solid and using special high speed steel counterboring tools and drills, one of these can be finished in a few minutes.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

### AIR PUMP PISTON HOLDERS.

The air pump piston holders, shown in Fig. 735, are applied to piston heads to prevent their turning when

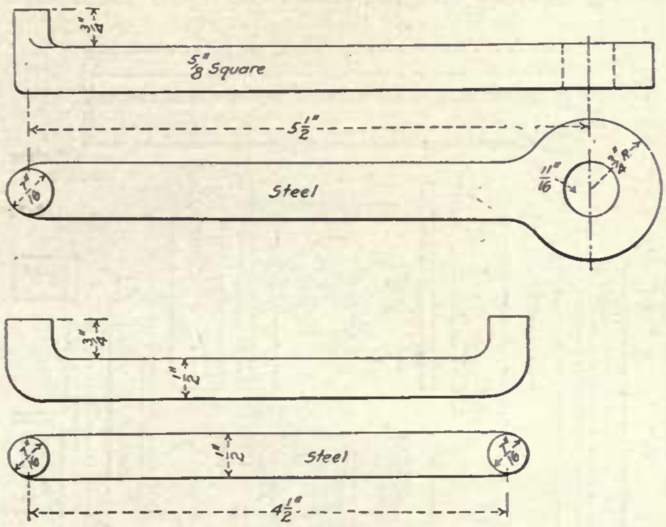



**Fig. 735—Air Pump Piston Holders.**

removing the piston rod nuts. The designs are exceedingly simple. Both are used constantly in the air brake department. The 7/16-in. lug at one end is placed in one of the holes in the piston and the other end is placed in the cylinder head stud hole in one case, or is held by the stud in the other.—*A. D. Porter, Shop Efficiency Foreman, Canadian Pacific, West Toronto, Canada.*

### AIR PUMP PISTON PACKING RINGS.

Packing rings for 9½-in air pumps are made in the following manner: A cast iron cylinder or barrel, large enough to make 25 rings, is bolted on the face plate of a lathe, and the inner edge *E*, Fig. 736, is turned off in order that a plug center may be forced against it while the cylinder is being turned on the outside. The outside, after it is turned, is filed smooth. The gang tool *B*, having 16 cutting tools spaced 9/32 in. apart, is then used to space off 24 rings in two operations, cutting in to a depth of 5/16 in. The twenty-fifth ring is cut off by a special tool. The tool *C* is then placed in the lathe. It

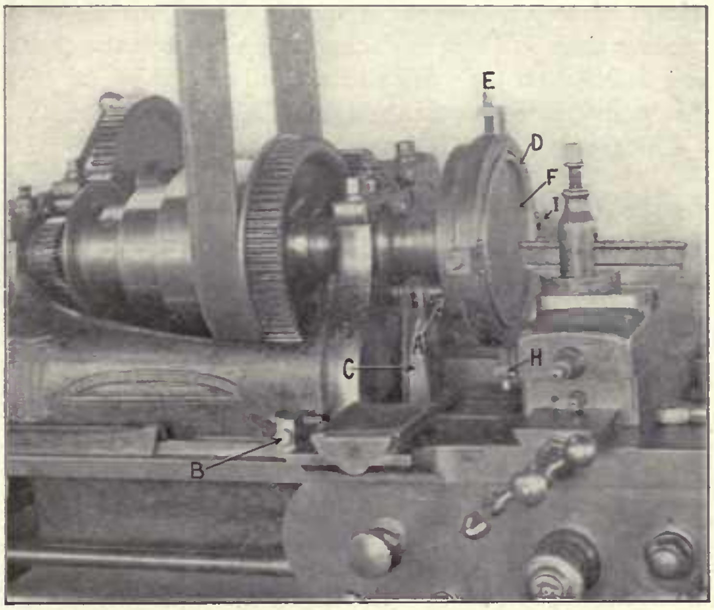



**Fig. 737—Magnetic Chuck for Finishing Packing Rings.**

has two adjustable boring tools which are adjusted to the finished inside diameter of the packing ring. As this boring tool advances the rings drop off one at a time; they are of the correct inside and outside diameter, but are not of the required thickness.

They are finished to the proper thickness on a magnetic chuck *F*, shown in Fig. 737. The chuck consists of a series of electro-magnets, arranged in a circle, with rectangular heads finished flush with the face of the chuck, as shown in the photograph. The electric current is conducted to brass discs or rings at the back of the

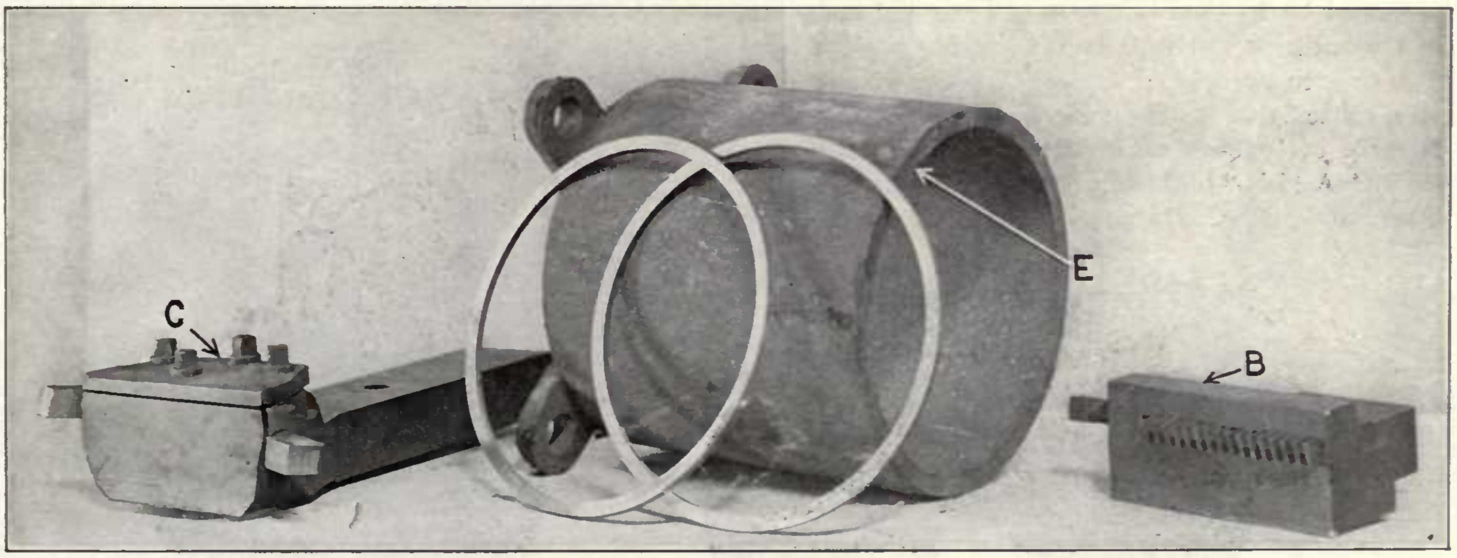



**Fig. 736—Tools for Boring and Cutting Off Packing Rings for Air Pump.**

chuck through the carbon brushes *A*. The brass rings are connected to the magnets. The brush holder *C* is bolted to the lathe, and both brushes are held firmly against the brass rings by means of springs. The inside diameter of the chuck face is equal to that of the largest size packing ring. For smaller rings the adjustable dogs *E, G, H* and *I* are used to keep the ring from sliding. In the photograph a 9⅝-in. ring is shown in a 10-in. chuck. The stop *B* is set so that the facing-off tool will come within ¼ in. of the face of the chuck. The unfinished packing ring, 9/32 in. in thickness, is placed in the chuck and finished on both sides to a thickness of ¼ in. By this method one man turns out 100 finished rings per day. —*Chicago & North Western, Chicago.*

AIR PUMP PISTON HOLDER.

One often hears an engineer coming in after an engine failure say that if he had only had something to hold the air pump piston from turning he would have brought his train in without trouble. The device shown in Fig.

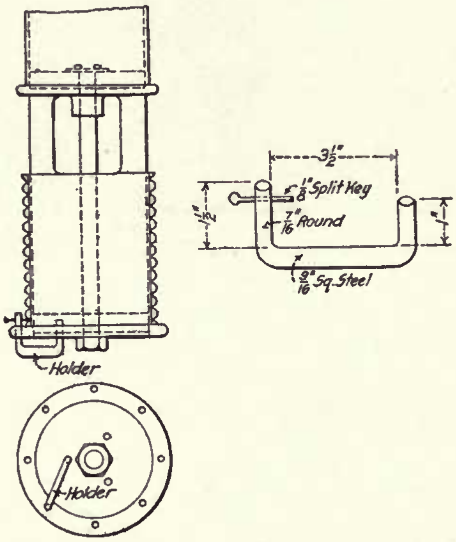



Fig. 738—Air Pump Piston Holder.

738 is so simple that it hardly seems worth while illustrating, and yet many an engine failure could have been prevented by its use. Every engineer could make one in a moment or two from an old packing hook, a large nail, or even by bending a piece of ⅜-in. wire into the form of the figure 3. The holder shown in the illustration is made of 9/16-in. square steel bent at each end as shown. A ⅛-in. hole is drilled ¼ in. from the end of the longer arm. This is for a split key to keep the holder in place, as shown on the drawing. All air pump piston heads have two or three holes in them, and by putting one end of the holder in one of these, and the other end in one of the cylinder head tap bolt holes, the piston head can be kept from turning.—*Thomas Naylor, Roundhouse Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. James, Minn.*

AIR PUMP REPAIR STAND.

One man can very easily handle an air pump while it is being repaired with the use of the repair stand shown

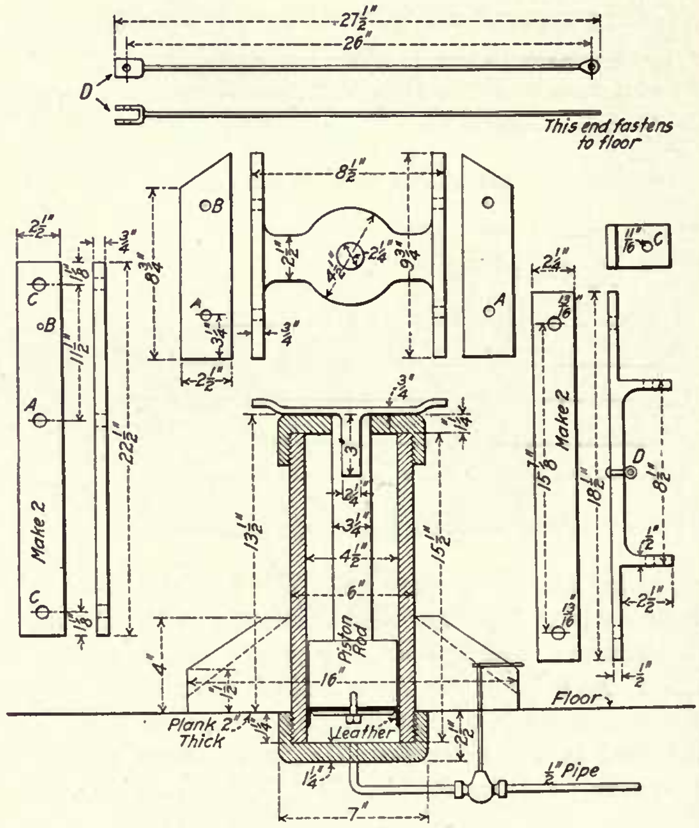



Fig. 739—Air Pump Repair Stand.

in Fig. 739. The table in a vertical position, with a pump ready to be bolted to it is shown at the right in Fig. 740.

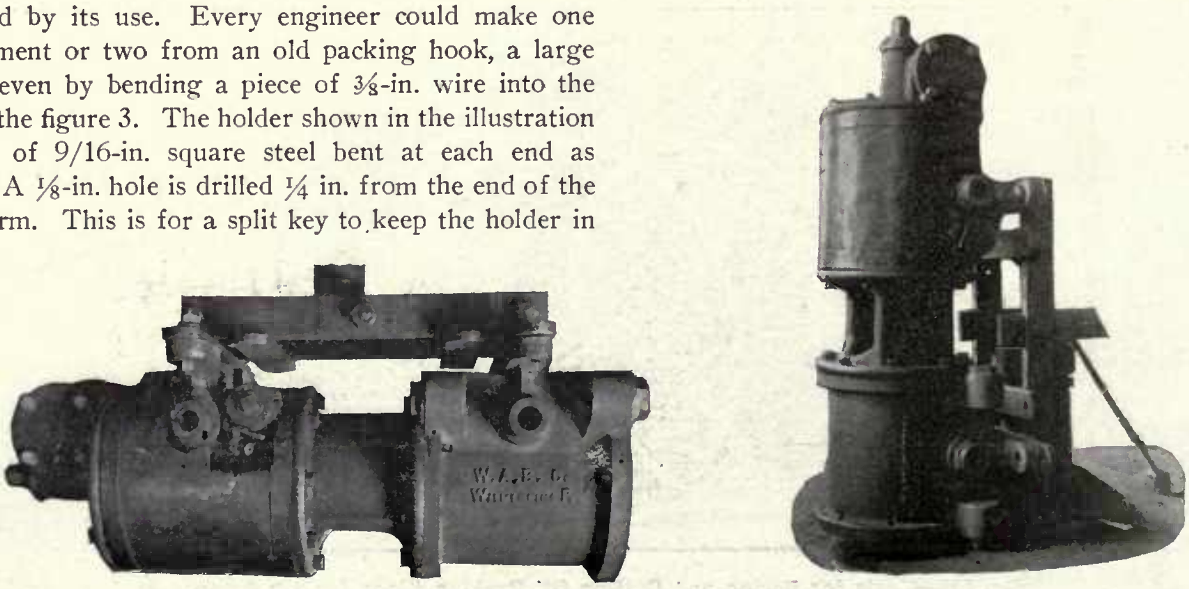


Fig. 740—Device for Handling Air Pumps.

The table pivots on a center leg, which is the piston of an air cylinder sunk into the floor. To the right, in Fig. 740, can be seen a diagonal rod, one end of which is pivoted to the table, while the other end is fastened in an eye-bolt in the floor. When the pump is secured to the table the air is turned on, the piston ascends and the rod at the end of the table draws it to a horizontal position, with the pump in a good position for repairing. When the table is in this horizontal position it is locked by means of a small pin; the rod at the end is removed and the pump and table can be swung around so as to secure the best light for working. The base is made from an old piston head spider and the cylinder is made from an old scrap hydraulic jack barrel.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

### AIR PUMP REPAIR STAND.

The use of the stand, shown in Fig. 741, greatly facilitates the making of repairs to an air-pump. Pumps undergoing repairs are lifted on the stand and bolted to the table which can be tilted to any angle up to 45 deg. from the horizontal in either direction. There is a center pin in the lower end of the pedestal which allows the top to turn on the base; the lock lever is operated by the workman's foot. With this stand the workman is always near his tools, as he practically does not change his position in working on a cylinder. He can also adjust his work to get the best possible light on it, which is a most important advantage.—*F. S. Robbins, Inspector, Pennsylvania Railroad, Renora, Pa.*

### AIR PUMP REPAIR STAND.

An air pump mounted on an adjustable table in the repair shop is shown in Fig. 742. The important feature of this arrangement lies in the table's being designed to be shifted and clamped at any angle. The base and upright are made in one piece of cast iron. The quadrant is also of cast iron, while the table top is formed of two wrought iron plates. The advantages of this table at once appeal

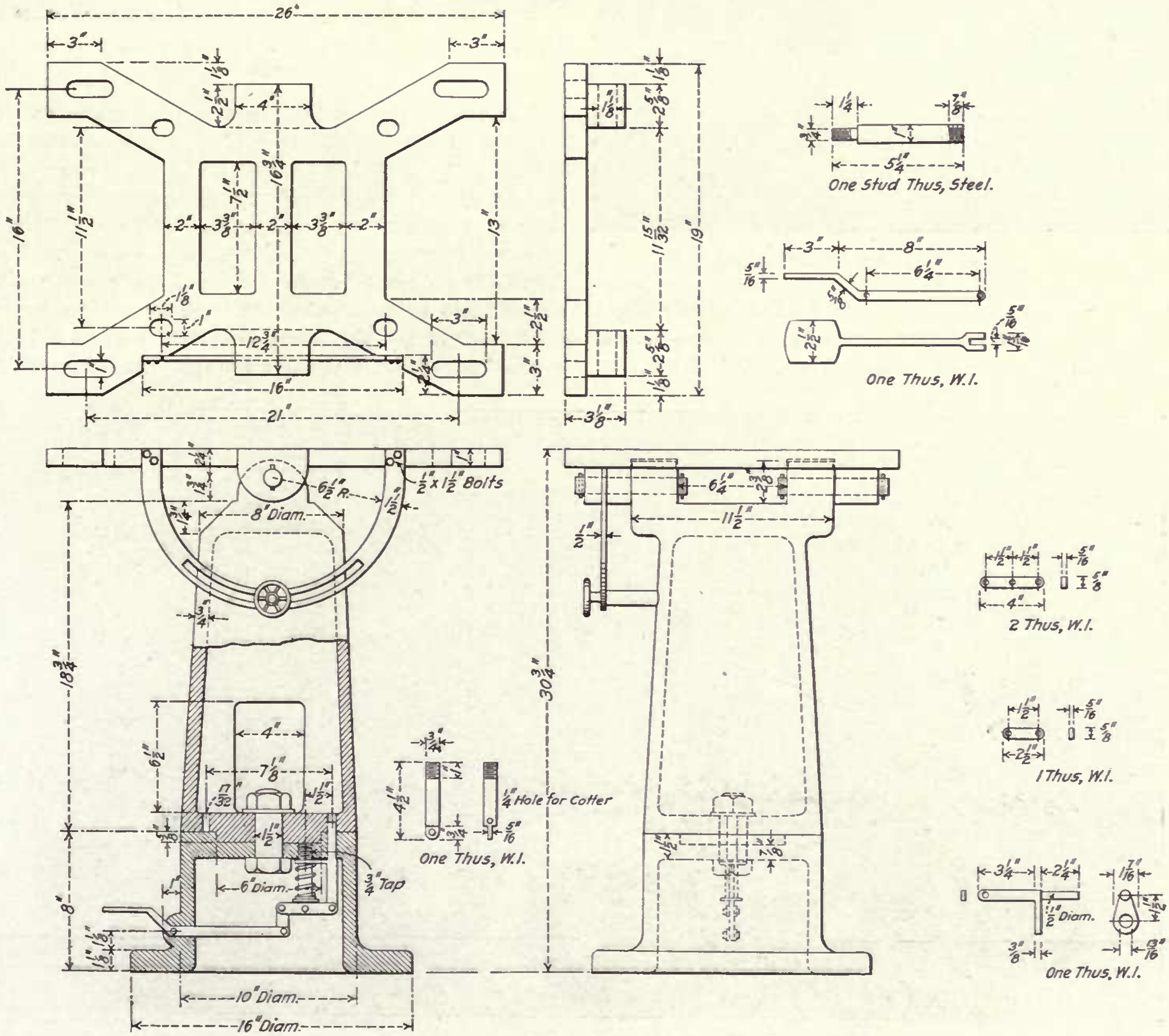



Fig. 741—Air Pump Repair Stand.

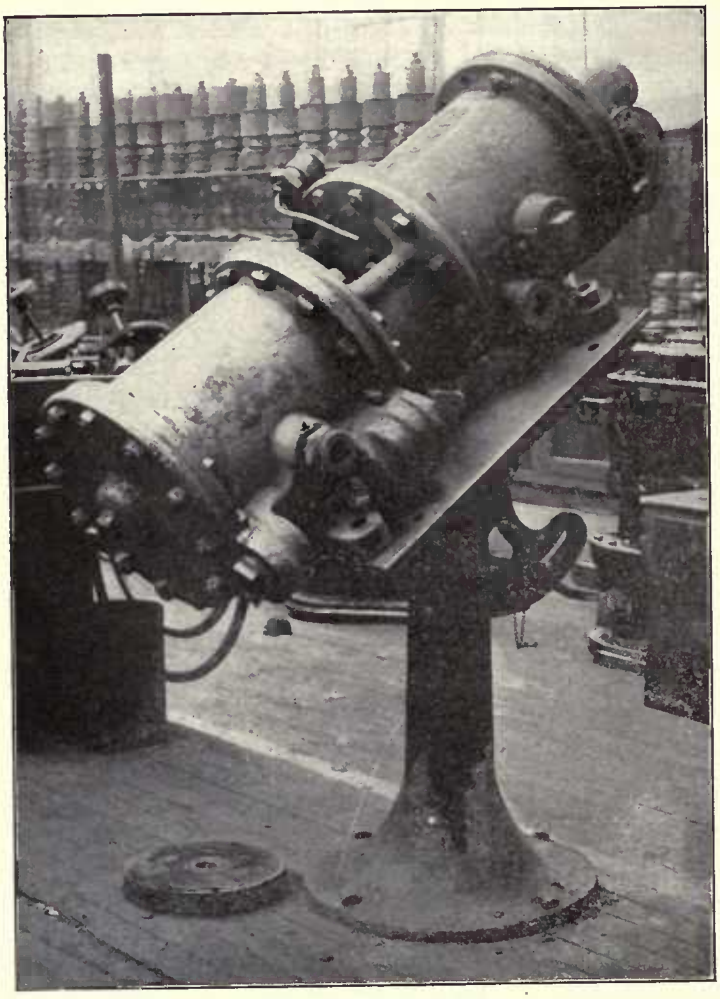


Fig. 742—Air Pump Repair Table.

to the man who has had to work on an air pump without any arrangement for convenience in working.—*Central Railroad of New Jersey, Elizabethport, N. J.*

AIR PUMP VALVE AND SEAT.

The valve seat for an air pump, shown in Fig. 743, is manufactured in the following manner: The forging *A* is made by the dies and formers shown in Fig. 744, which are used in an Ajax forging machine. A piece of round iron is held in the female die at *E*, and is partly upset and the hole punched in it by the plunger *B*. The forging is completed in a second operation by the plunger *D* and the die *C*. It is then cut off and finished in a turret lathe by the tool shown in Fig. 743. At the first operation the reamer *G* faces off the threaded end and roughs out the

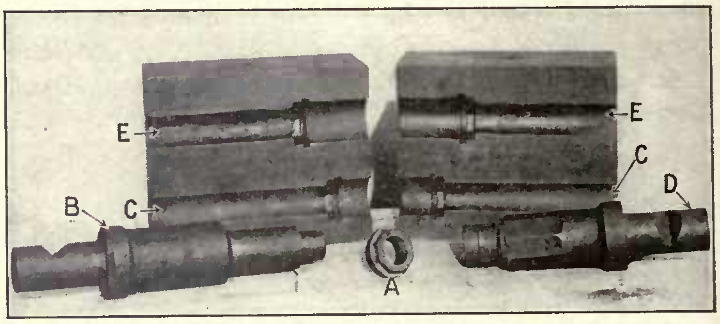



Fig. 744—Dies and Formers for Forging Valve Seat for Air Pump.

inside; the turning tool *H* finishes the outside to the diameter of the thread. To cut the recess between the threads and the bottom of the seat at *M*, a lever *K* is thrown up and the tool takes a deeper cut, this being done by means of an eccentric *L*. The throw of the eccentric is regulated by an adjusting screw *J*. The forging is then threaded by the die *O*, after which it is screwed into a chuck, and the seat end is machined to the correct angle and the inside diameter is finished by a special reamer *P*. The valve for this seat is forged by

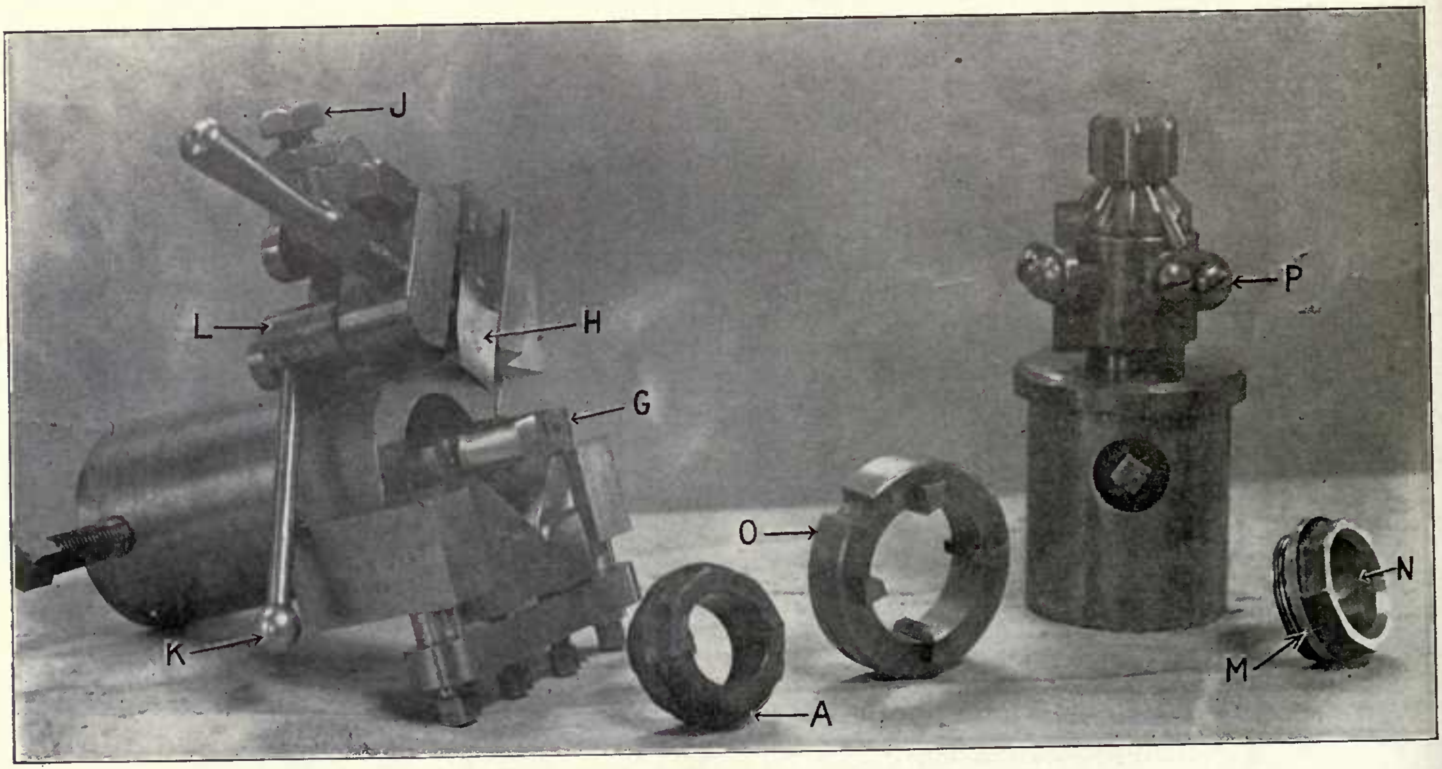



Fig. 743—Tools for Machining Valve Seat for Air Pump.

the dies shown in Fig. 745. The flanges of the valve *F* are flattened from the round iron at a white heat in the dies at *A, B* and *C*. The last operation is performed in *D* by the plunger *E*. These valves are formed on both

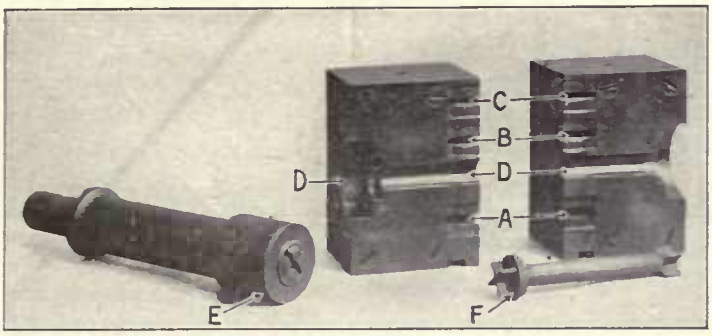



**Fig. 745—Dies and Former for Forging Air Pump Valve.**

ends of a round bar which is cut in the middle. They are then finished in a turret lathe by the cross feeding or side adjusting tool, as shown in Fig. 746. The cutting tool is set for the correct angle of the valve seat and is fed across the lathe at right angles to the work. The

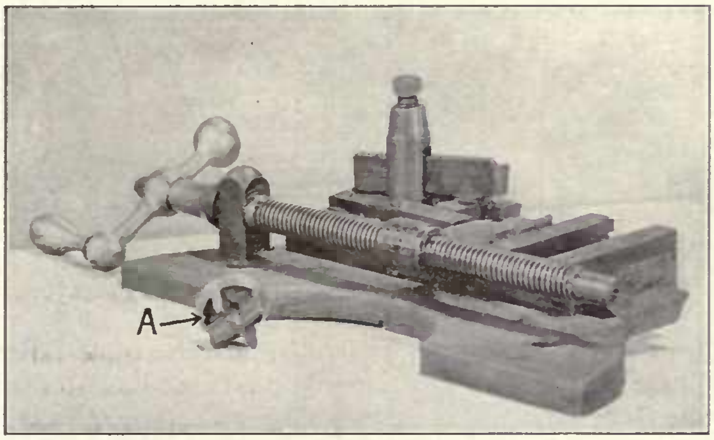



**Fig. 746—Tool for Finishing Air Pump Valves on Turret Lathe.**

valve *A*, Fig. 746, is held by a two-jaw chuck in the spindle of the machine. The cross-feeding device is bolted to the tail-stock.—*Chicago & North Western, Chicago.*

ENGINEER'S BRAKE VALVE TOP CASES, REPAIRING.

A large saving in brake equipment maintenance is effected by bushing the hole in the top of engineer's brake

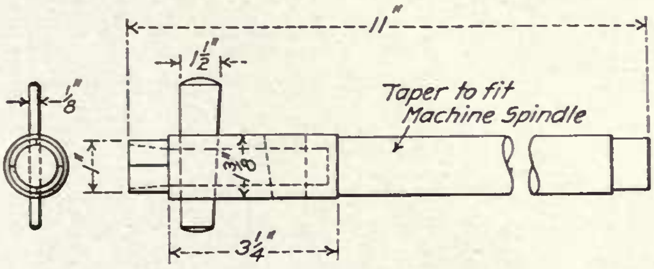



**Fig. 747—Expansion Chuck.**

valve top cases, through which the rotary valve key passes. This hole becomes worn, allowing the key to rattle and air to escape at the key washer. Unless this hole can be bushed the worn top case must be replaced by a new one. It is a simple matter to bore out the hole, bush it, and bore out the bushing to the required size, as the case can easily be fastened to the lathe face-plate. But facing off the inside end of the bushing, against which the washer bears, is difficult unless some sort of special chuck is employed. The one shown in the drawing, Fig. 747, is probably as simple, and at the same time as efficient a one as could be devised. Its application is shown in the photograph Fig. 748. The taper fit of the

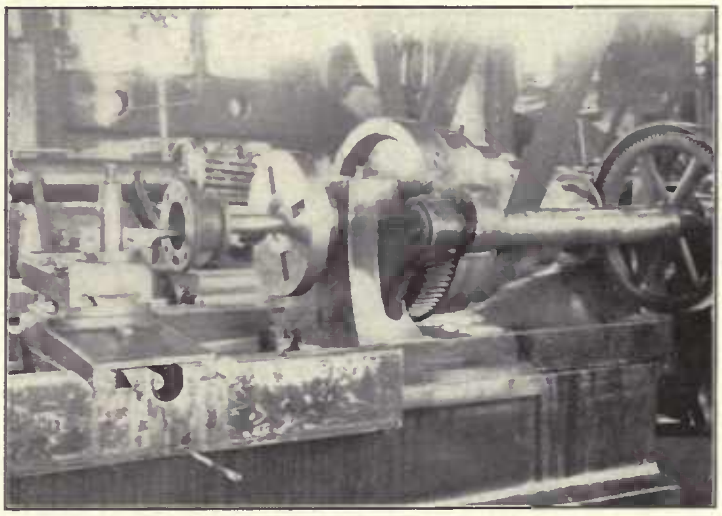


**Fig. 748—Expansion Chuck as Used on a Lathe.**

chuck shank fits in the lathe spindle, while the opposite end fits the hole in the top case. The chucking end is sawed through up to the shoulder on two diameters at right angles to each other. A conical wedge, with a straight shank is drawn into the split portion of the chuck, expanding it in the top case hole and gripping the top case firmly. The flat, taper key is driven in one slot to spread the end of the chuck and in the other to close it again.—*Long Island Railroad, Morris Park, N. Y.*

TRIPLE VALVE PACKING RING GRINDER.

A triple valve packing ring grinder designed for grinding four valves at the same time is shown in Fig. 749.

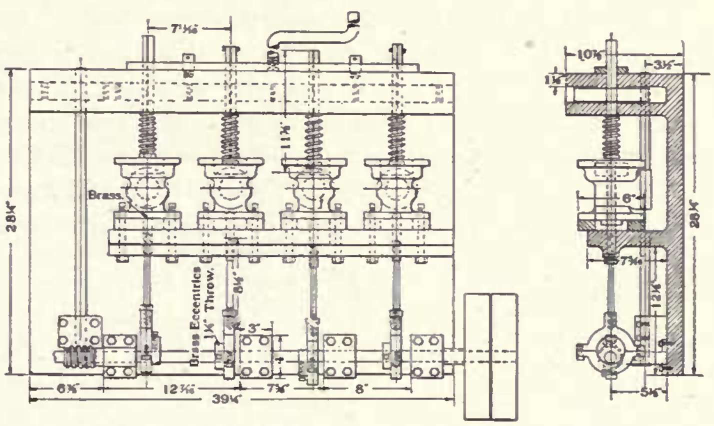



**Fig. 749—Triple Valve Packing Ring Grinder.**

These valves are slipped over the vertical bolts and are held securely in position by keys which fit in the top of the bolts. The valves are rotated and the cam shaft at the bottom gives a vertical reciprocating motion to the piston, which combination of motions grinds the packing rings in a very satisfactory manner. The upper part of the shafts which grind the valves, and which are revolved by the spur gears in the top of the frame, may be lifted upward, thus allowing the valves to be slipped into place. This machine has a capacity for 50 triple valves per hour. —*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

### TRIPLE VALVE PISTON COMPRESSOR.

A clamp for closing up packing ring grooves in triple valve main pistons is shown in Fig. 750. It is bolted to

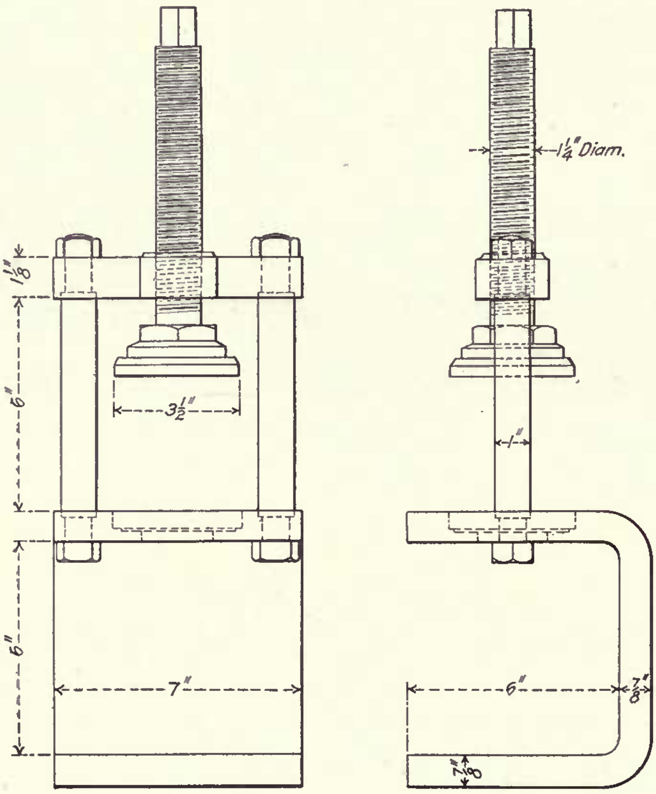



**Fig. 750—Triple Valve Piston Compressor.**

the bench in the position shown. The 3½-in. diameter ram is loosely fastened to the 1¼-in. threaded bolt. It is made loose to permit its seating evenly against the piston, which rests in the bored impression in the upper side of the U-shaped base. An improvement in this respect could be made by using a ball shaped connection, rather than the flat one which the device now has. Before placing the triple valve piston in the impression its packing ring is snapped into position to prevent the groove from being closed too much. A 36-in. double end wrench provides a sufficient amount of leverage, so that grooves are easily closed and marks or burrs can also be pressed out.—*Central Railroad of New Jersey, Elizabethport, N. J.*

### TRIPLE VALVE PISTON PACKING RING GRINDING TOOL.

The grinding of triple valve piston packing rings was formerly done at the Elizabethport shops by a tool made of a piece of ¾-in. round steel, a hole being drilled in one end to receive the piston stem and a handle being placed on the other end, similar to the one shown on the accompanying sketch. The piston stem was secured to the tool by a set screw; this arrangement was unsatisfactory because of the set screw slightly damaging the end of the piston stem. We are still grinding most of our triple valve piston packing rings by hand, as it is doubtful if any time can be saved, or better work be done, by the use of a machine, unless a number of men are engaged in this class of work and a machine is provided that will grind at least eight triple valves at one time. Experience has taught us that it is much more important to have the

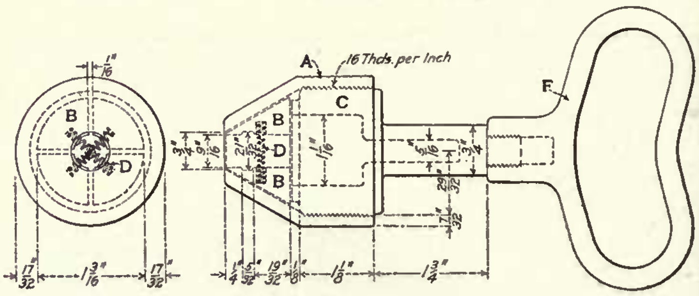



**Fig. 751—Triple Valve Piston Packing Ring Grinding Tool.**

triple valve piston cylinder bushing and the triple valve piston packing ring groove put in good condition, so that the triple valve piston packing ring is a perfect fit in the groove and in the cylinder bushing. The grinding of the ring is then a simple operation. If the triple valve cylinder bushing is not in good condition, we roll it with a special triple valve roller and also true up the triple valve piston packing ring groove if it is necessary. The improved tool for grinding the piston packing ring is shown in Fig. 751. The adjusting nut *A* contains four jaws *B*, which are held apart by the coil springs *D*. In using the tool, the piston stem is placed between the four jaws, and the adjusting nut *A* is held in one hand while the stud *C* is revolved and moved inward by means of the handle *F*, thus closing the jaws *B*.—*Frank J. Borer, Foreman Air Brake Department, Central Railroad of New Jersey, Elizabethport, N. J.*

# Oil House Kinks

BARRELS, DEVICE FOR EMPTYING.

The device for emptying barrels by air pressure, which is shown in Fig. 752, is easily constructed and affords a rapid and cleanly method of transferring oil from barrels to storage tanks. The brass plug is screwed in the bung hole and the 1-in. pipe through which the oil is forced from the barrel fits snugly in the bushing which screws into the plug; the cotton packing makes a tight joint between the plug and the pipe. Compressed air enters through the ¼-in. air cock and nipple and passes down

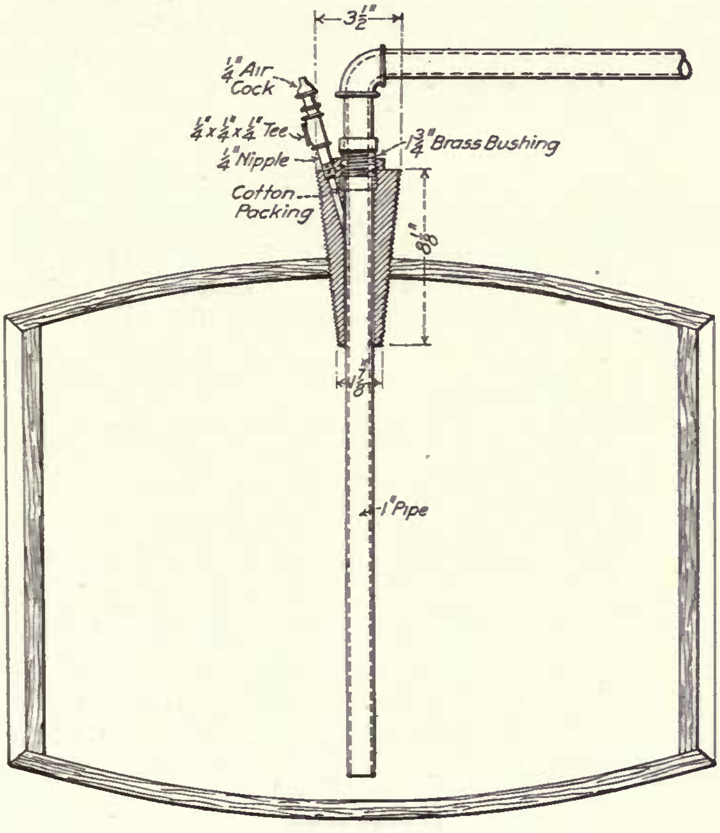



Fig. 752—Device for Emptying Barrels by Compressed Air.

through a groove between the pipe and the brass plug, thus forcing the oil from the barrel.—*P. F. Smith, Chief Draftsman; Thomas Marshall, Master Mechanic, and Henry Holder, General Foreman, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.*

GREASE PRESS.

A press for forming grease for Elvin driving box grease cellars or sticks for use in side or main rod cups is shown in Fig. 753. A 12-in. x 14-in. brake cylinder is mounted on a frame in a vertical position, as indicated. Adjustable forms are made to suit the various sizes and designs of grease cups and driving box cellars. The illustration shows the machine arranged with forms for making dope sticks for rod cups. This press is usually located

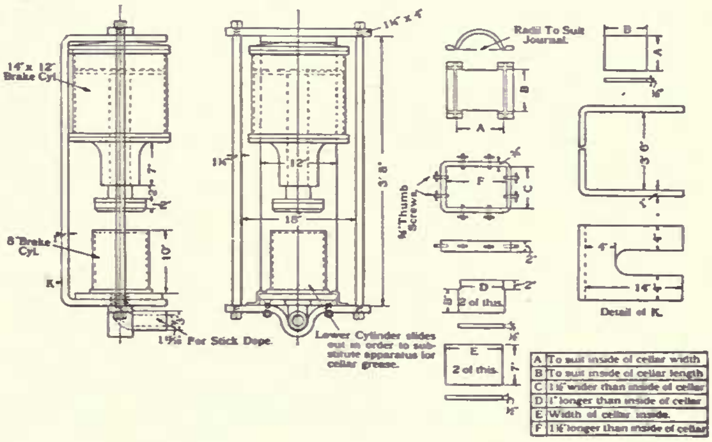



Fig. 753—Grease Forming Press.

in the oil houses at large division points.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

GREASE PRESS.

A press for forming solid grease candles or sticks for rod cups is illustrated in Fig. 754. There are a number

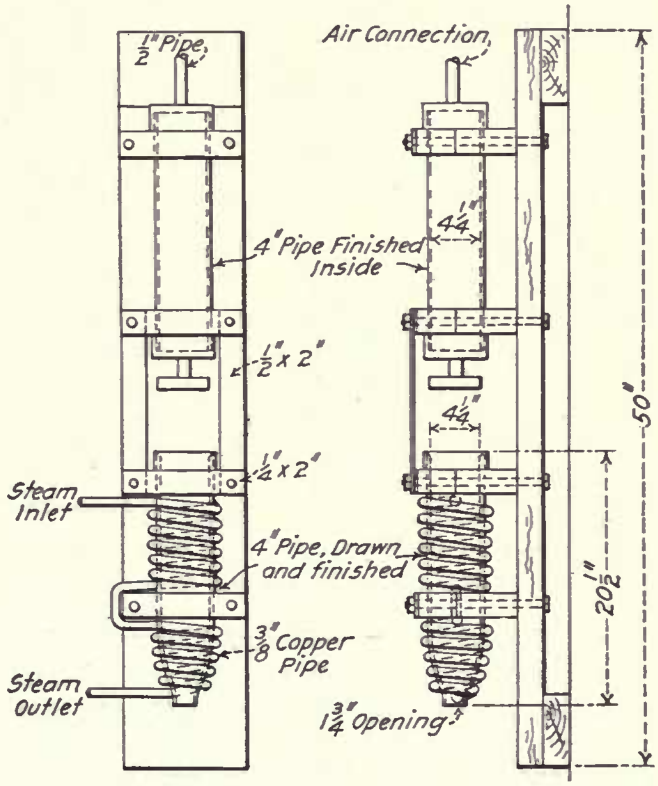



Fig. 754—Press for Molding Grease for Rod Cups.

of presses made for this purpose, but the one shown has at least one feature which makes it far more efficient than other designs. A 4-in. pipe is finished inside and provided with a piston and forming head. The cylinder is mounted vertically on a 2-in. plank and the usual connections arranged to operate it with air. Just below the power cylinder is a similar cylinder drawn down at the lower end to a 1¾-in. opening. Around it is wrapped a coil of ⅜-in. copper pipe, forming a steam radiator for warming the former and the grease within. The heat reduces the density of the grease and makes it much easier to mold or form.—*S. S. Lightfoot, Bonus Demonstrator, Atchison, Topeka & Santa Fe, San Bernardino, Cal.*

GREASE PRESS.

A home-made affair for forming the grease to the proper shape to fit the grease cups and consisting of three cylinders in tandem, with the pistons connected by a common rod, is shown in Fig. 755. The cylinders 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, Fig. 756, 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 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 returning the pistons to their normal positions.—*Delaware, Lackawanna & Western, Scranton, Pa.*

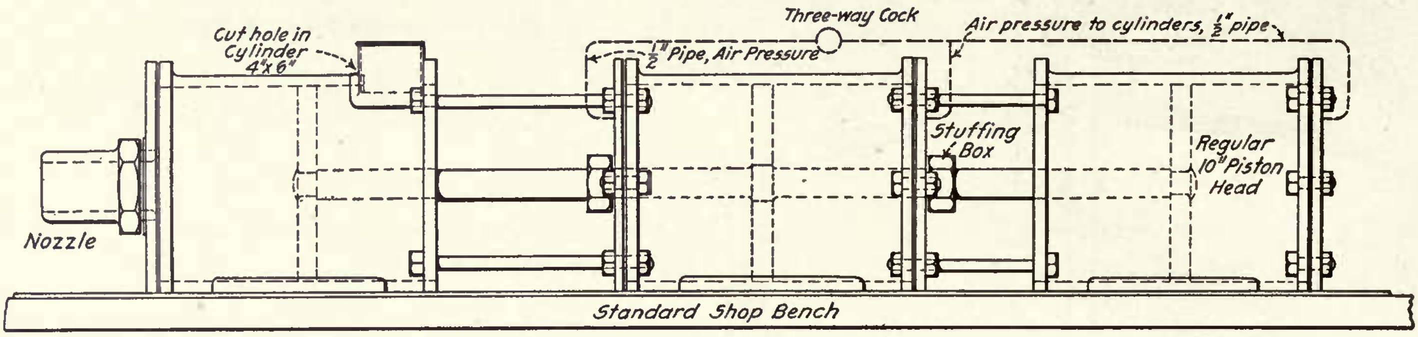



Fig. 755—Grease Compressor.

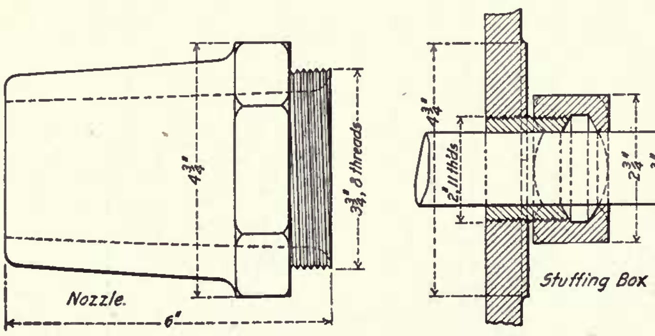



Fig. 756—Grease Compressor Nozzle.

GREASE PRESS.

Instead of pounding the grease into the Elvin driving box cellar by hand, a molding machine has been devised. The grease forms are made of two kinds, one being of a size to fill the cellar and the other being for shimming or filling pieces 1 in. thick to slip into the bottom of the cellar as the grease above is used up. This saves dropping the cellar and filling the casing, and can go on indefinitely until the engine comes in for repairs. The grease press consists of a 16-in. air cylinder with a 54-in. stroke, bolted to a 12-in. grease cylinder of equal stroke. On the end of the latter is a nozzle 18 in. long, with four different sizes of tips for the corresponding sizes of grease cellars. The cylinders lie on their sides, the filling hole for the grease chamber being at the rear end, on top. The grease is pressed out on a board having nailed to the back side a strip with six equi-distant slots, or saw kerfs, in it. The grease cutter is an old hand saw with the teeth ground off and the edge sharpened. The nozzle for the filling or shimming pieces is 16 in. long and there is only one size of tip. The large forms are put in tin casings and packed in boxes for shipment. The fillers are laid flat in boxes with paper between the layers. There is also a former for rod-cup grease, on the same principle, with different-sized nozzles. The grease is cut to 22-in. lengths and put in holders made of old boiler tubes, 24 in. long, with a wooden plug in each end. The engineman keeps one of these in his seat box.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

GREASE PRESS.

A press for molding the grease to fit the grease cups on locomotive connecting rods is shown in the photograph, Fig. 757. The power is furnished by two 8-in. air-brake cylinders, placed tandem. The grease is placed in one end of a third cylinder of the same size. The grease hopper is made of light copper plate, is 7½ in. high, 6¼ in. square at the top, and has an opening into the cylinder about 3½ in. square. The grease is pressed out through the pipe at the left-hand end of the cylinder, and is cut into pieces of the proper length by means of the spacing box, part of which is shown just behind the cake of grease that is being pressed out. The cutting is done with a simple form of knife made of a piece of thin sheet iron and shown in the photograph. To return the pistons to their initial positions, air is admitted to the left end of the middle cylinder by means of a three-way cock. The apparatus is bolted on a steel plate, ¼ in. thick and 7 ft. long, which is flanged down on the sides and is supported by cast iron legs, braced by wrought iron straps. The middle cylinder and the one containing the grease are tied together by two ⅜-in. rods, as well as being bolted to the table. A shelf for the storage of the grease cakes, built of 3/16-in. steel plates, is fastened to the wall at the right of the press, and contains three compartments.—*Delaware, Lackawanna & Western, Buffalo, N. Y.*

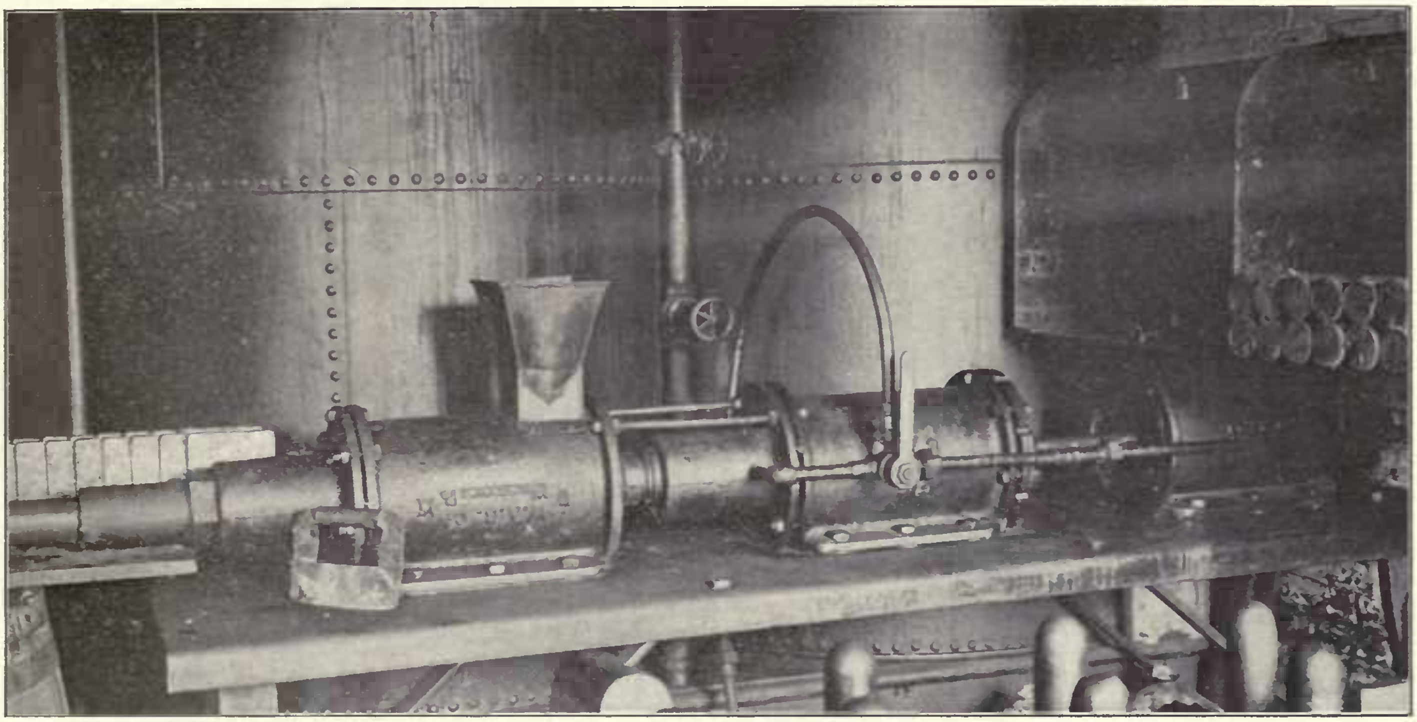


Fig. 757—Press for Preparing Grease Cakes for Connecting Rod Grease Cups.

GREASE PRESS.

A pneumatic press for forming grease cakes is shown in Fig. 758. A feature of this device is the convenient way of refilling the cylinder after the grease has been pressed out. The cylinder is hinged, and may be dropped down by removing a pin, after which it may easily be refilled with grease. Three grease cakes for a 10-in. x 12-in. driving journal can be made with one filling of the cylinder. The cake, 36 in. long, is pressed out through the forming nozzle at one end of the cylinder and drops on a table, where it is cut into suitable lengths by a knife attached to a sliding hinge at the back of the table. The different sizes of nozzles may be easily and quickly changed and adjusted. The grease cylinder is made of 10-in. pipe, 17 in. long, and an ordinary 12-in. x 12-in. air cylinder.—*D. P. Kellogg, Master Mechanic; W. F. Merry, General Foreman, and G. H. Goodwin, General Gang Foreman, Southern Pacific, Los Angeles, Cal.*

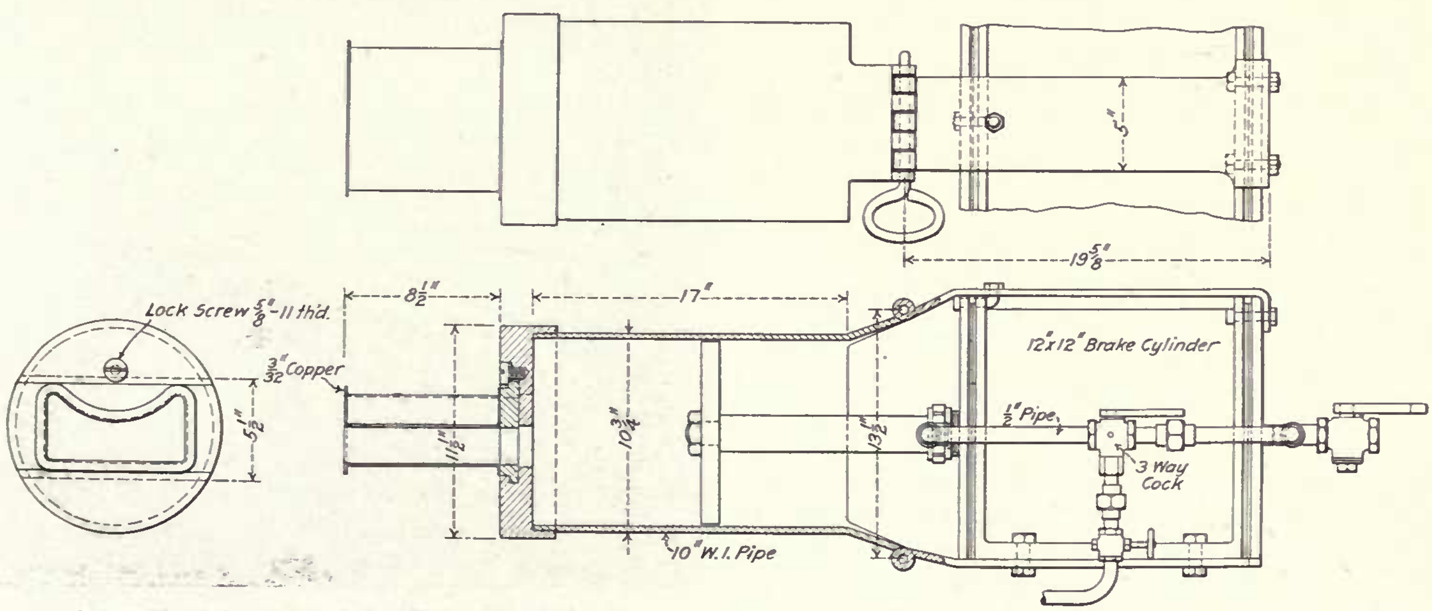



Fig. 758—Pneumatic Press for Forming Grease Cakes.

GREASE PRESS.

The press for forming Elvin grease packing for use in driving box cellars, Fig. 759, is installed in the oil house. The 12-in. x 10-in. cylinder is bolted to a 3/8-in. steel plate, which is fastened on the two 6-in. x 6-in. wooden posts. The bottom of the press is closed and

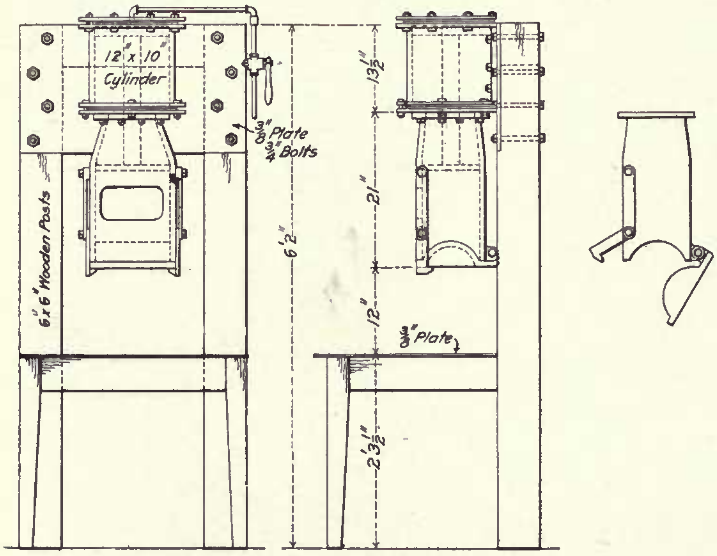



Fig. 759—Press for Forming Grease for Driving Box Cellars.

held in place by the two latches. Grease is then put through the hole just below the plate on the lower end of the piston rod, after which air is allowed to enter the cylinder and the grease is pressed to shape. Before this press was placed in commission the grease was pounded to shape by hand, which was a slow and expensive process.—*Richard Beeson, Roundhouse Foreman, Pittsburgh & Lake Erie, McKees Rocks, Pa.*

JOURNAL BOX PACKING, CLEANING.

For cleaning packing which has been removed from journal boxes, a tank has been constructed of heavy

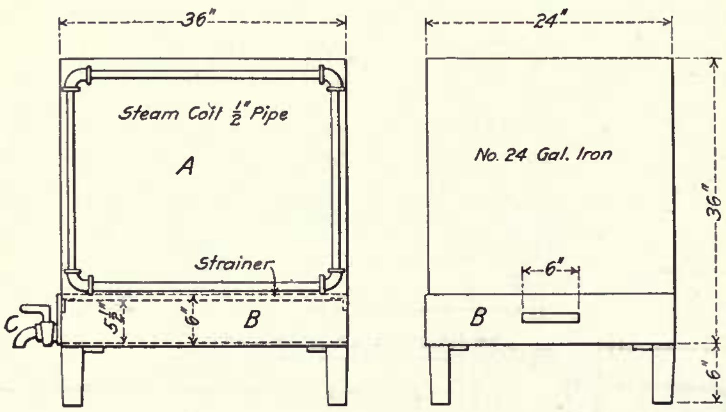



Fig. 760—Tank for Removing the Oil from Old Journal Box Packing.

galvanized iron, fitted with a steam coil, as shown in Fig. 760. The waste is allowed to remain in this tank 24 hours, at the end of which time most of the oil has been drained to the bottom and through the strainer into the compartment *B*. The oil as it accumulates may be drawn off through the cock *C*, after which it may be again strained and prepared for use. The compartment *B* is so arranged that it may be removed occasionally for clean-

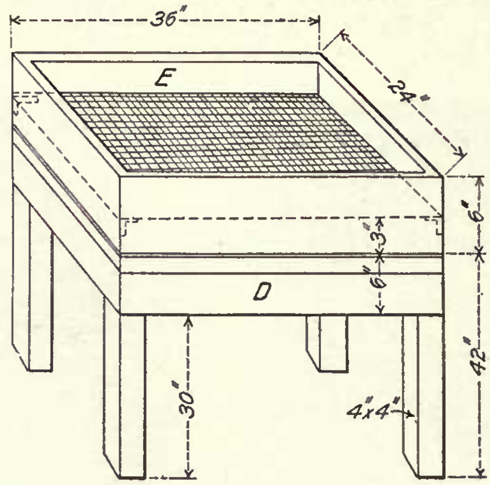



Fig. 761—Table for Cleaning Journal Box Packing From Which the Oil Has Been Removed.

ing. When the waste is removed from the tank it is placed on the cleaning table shown in Fig. 761 and is thoroughly shaked and cleaned, the dirt and dust passing through the screen, which has openings ½ in. square. After this treatment the waste is saturated with fresh oil. —*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

JOURNAL BOX PACKING, PREPARING.

The method of preparing the packing for journal boxes at the East Buffalo shops of the Delaware, Lacka-

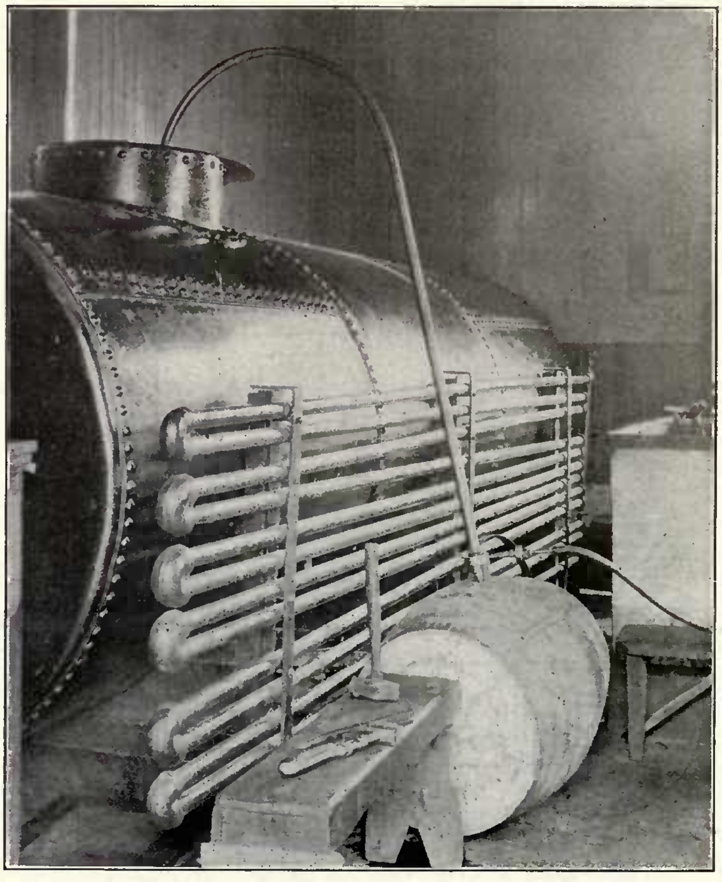


Fig. 762—Storage Tank for Journal Packing Oil.

wanna & Western is especially good. The waste must soak in the oil for not less than 24 hours and must contain four pints of oil to each pound of waste. This proportion was determined on after considerable experimentation. Five pints and four and a half pints to each pound of waste were tried and found to be excessive. The waste is stored in a compartment, or bin, 7 ft. x 5½ ft., which may be extended as high as is necessary by slats. The oil is received in barrels and is forced by compressed air into a tank having a capacity of 36 barrels, or about 1,800 gallons. To do this the bung is removed from the barrel and a brass plug is screwed in the hole. A piece of 1¼-in. pipe slips through a hole in the plug and extends to the lower side of the barrel. The upper end of this pipe is bent over and drops down into the manhole of the large tank, as shown in Fig. 762. The air enters the top of the barrel through a ½-in. pipe in the brass plug. A rubber gasket on the 1¼-in. pipe at the top of the brass plug prevents the air from escaping at the joint. The maximum air pressure is automatically controlled, so that there is no danger of bursting the barrel. The steam pipes alongside the tank keep it warm and heat the room in cold weather.

On the other side of the room are five tanks (Figs. 763 and 764) constructed of ¼-in. steel, 32 in. in diameter inside and 36 in. high. These are supported on 9-in. I-beams resting on the concrete floor. To prepare the packing 90 gallons of oil are run into one of these tanks, and to this is added 80 lbs. of wool waste, the latter being put in carefully in order to saturate it thoroughly with the oil. This mixture is allowed to stand not less than 24 hours. At the end of that time, or when the waste is needed, the globe valves in the 1½-in. pipe at the bottom of the tank are adjusted so that the surplus oil can drain into an empty tank. When the height of the oil has reached about the same level in both tanks, as determined by putting a measuring stick down through the vents at the sides of the tanks, the ⅝-in. plate or piston is pressed down on the waste until 50 gallons of oil have been forced into the second tank. The oil is measured by a measuring stick properly calibered. The packing then contains 40 gallons of oil, or four pints to each pound of waste, and is ready for use. As shown by the drawing, each tank contains a cast iron strainer near the bottom.

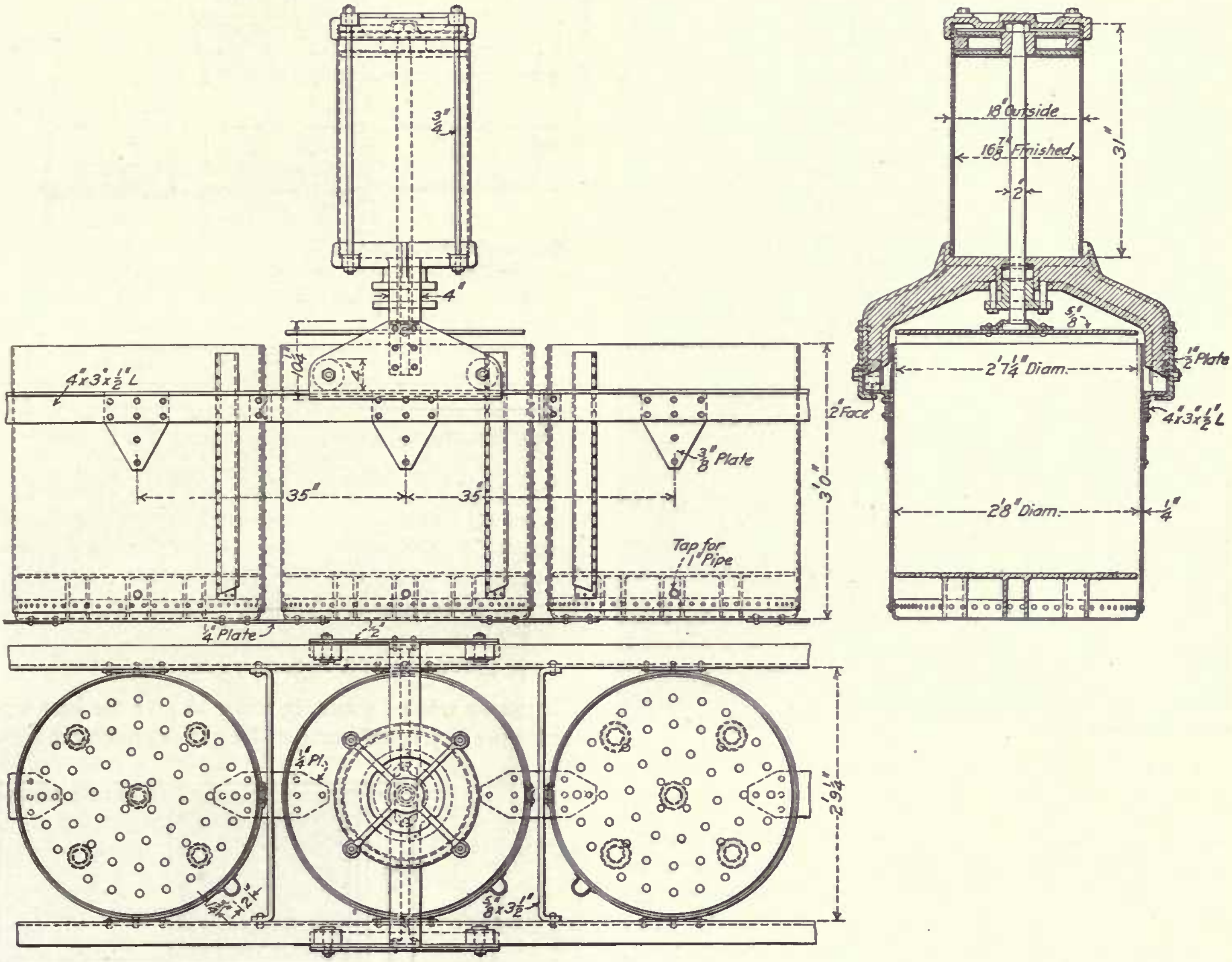



**Fig. 763—Tanks for Preparing Journal Box Packing.**

The lower head of the air cylinder which furnishes the pressure is a casting and has two arms which extend down over the sides of the tank. Each of these is riveted to a ½-in. plate, which has a flange 25 in. long extending under the horizontal members of the 4-in. x 3-in. x ½-in. angles, which are riveted to the sides of the tanks. These angles are tied to each other at the ends and between the tanks by 3½-in. x ⅝-in. iron braces, which are turned over at the ends and riveted to the angles. When the cylinder is not exerting pressure it rests on four 4-in. rollers, 2 in. wide, which run on the top of the angles; the

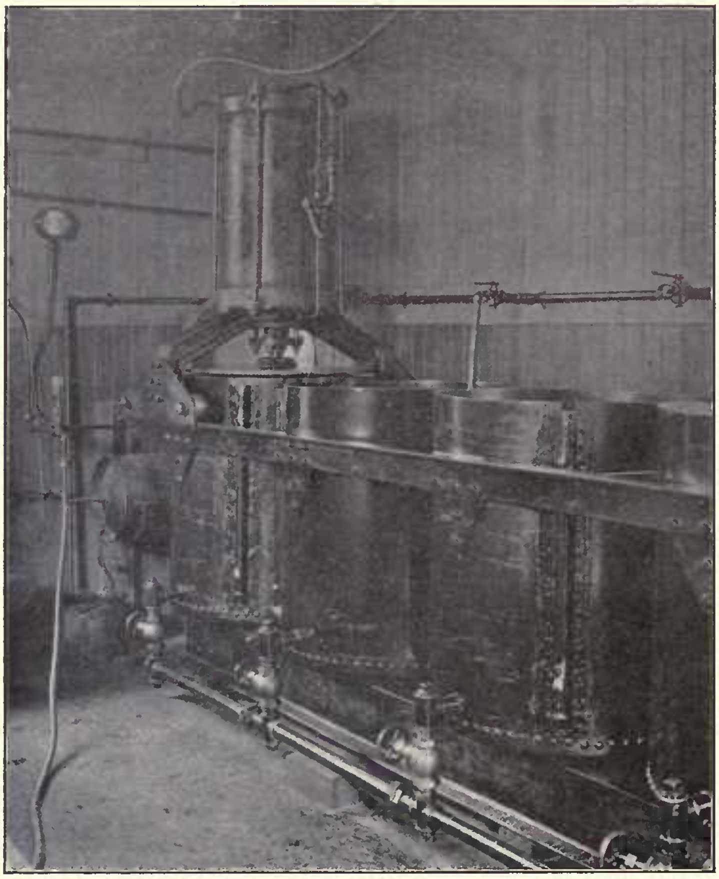


**Fig. 764—Tanks and Press for Preparing Journal Box Packing.**

cylinder can thus be moved easily from one tank to another. Air is admitted to either side of the piston by means of a three-way cock. The cylinder is constructed of a piece of pipe, 18 in. outside diameter, which screws into the two cast iron heads. In addition to this the heads are tied to each other by four ¾-in. rods. The cylinder has a stroke of about 27 in., the piston rod being 2 in. in diameter.

Oil is transferred from the storage tank to the smaller tanks in the following manner: A small tank holding 20 gollons rests on the floor at one end of the storage tank and below it. The oil is allowed to flow into this small tank by gravity and when it is filled the connection to the storage tank is closed. By admitting air to the top of the 20-gallon tank, all of the oil can be forced out of it into any one of the other tanks in a few moments; it is delivered to the tanks through the spigots shown in Fig. 764.

The prepared waste is transferred to a galvanized iron vat 30 in. x 60 in. x 30 in. high. This contains a strainer at the bottom and the surplus oil is drawn off from time to time and sprinkled back over the top of the waste. The waste is also handled about occasionally to make sure that it is as nearly uniformly saturated with oil as possible.—*Delaware, Lackawanna & Western, East Buffalo, N. Y.*

JOURNAL BOX PACKING, PREPARING.

For preparing packing for use in journal boxes, three tanks are provided, as shown in Fig. 765. In each of the two larger tanks, *A* and *B*, are placed 80 lbs. of waste and 560 lbs. of oil. After the waste has had sufficient time to become thoroughly saturated, 240 lbs. of oil are

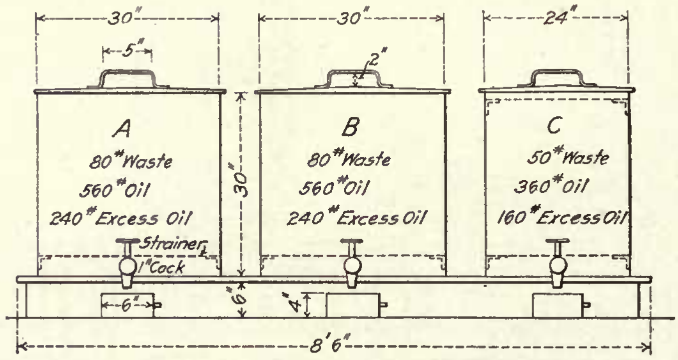



**Fig. 765—Tanks for Preparing Journal Box Packing.**

drained off, leaving 320 lbs. of oil to 80 lbs. of waste, or 4 lbs. of oil to each pound of waste. The third tank *C* is smaller than the other two, and is used for the preparation of waste which has been reclaimed.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

JOURNAL BOX PACKING, PREPARING.

Cotton or woolen waste, in order to give the best service for use in journal boxes of freight or passenger cars,

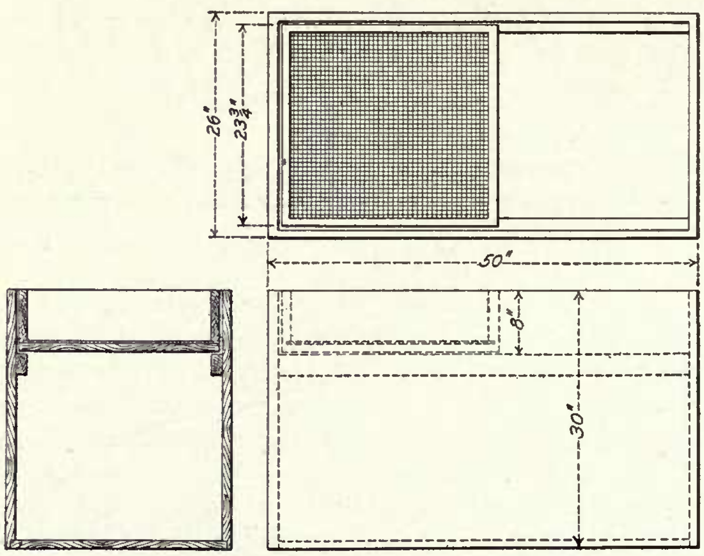



**Fig. 766—Tank for Preparing Journal Box Packing.**

should be thoroughly soaked in oil, after which the surplus oil should be allowed to drain off. Waste prepared in this way can be packed more firmly about the journal and will give much more satisfactory results than if it is placed in the box too wet. A box, or tank, for preparing the waste is shown in Fig. 766. The inside is lined with heavy galvanized iron, and two cleats are placed on the inside of the box about 8 in. from the top, as shown. These support a tray, which has for its bottom a 1/16-in. mesh wire netting. The tray is only about one-half the length of the box, and may be shifted from one end to the other. The lower part of the box is filled with oil and waste. After the waste has become thoroughly saturated, it is transferred to the tray, and the surplus oil is allowed to drain off. It is removed from the tray in dope buckets as it is needed.—*A. G. Pancost, Draftsman, Elkhart, Ind.*

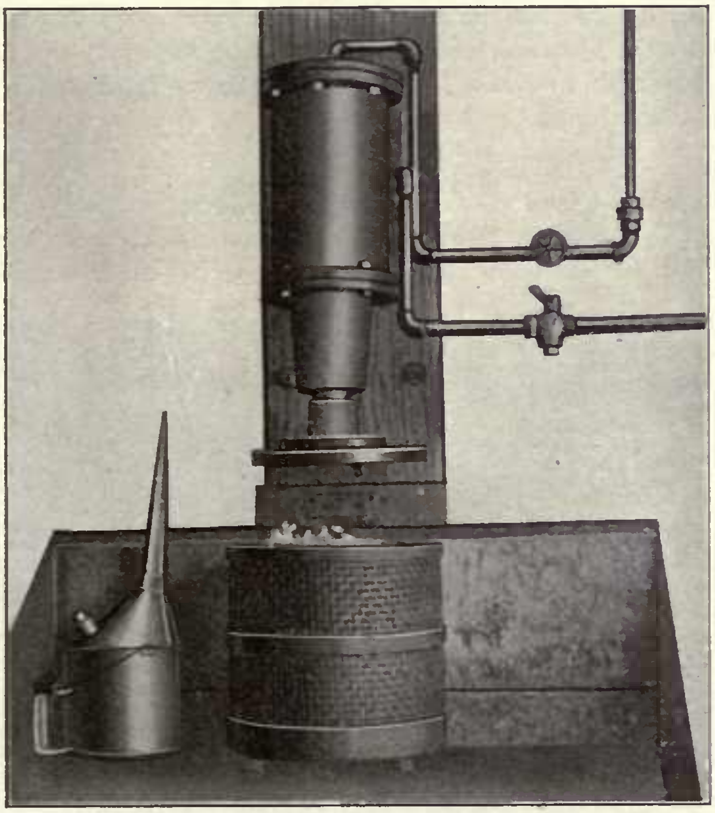


**Fig. 767—Journal Box Packing Press.**

### JOURNAL BOX PACKING PRESS.

The press shown in Fig. 767 is one which was first gotten up at the Mt. Clare shops, but is now used in all the shops of the Baltimore & Ohio. The wire basket, into which the saturated waste is placed, is about 14 in. high and 16 in. in diameter. An ordinary 8-in. freight car brake cylinder is mounted on a rack above the wire basket. A piston is secured to the end of the rod, and this is driven down on the basket filled with oily waste. The basket rests on a tinned floor which drains into an open oil tank. Air pressure at about 60 lbs. is used. On being taken from the basket the waste is thoroughly soaked with oil, but there is no loss from drippings. By this method, all waste for journal boxes is alike as regards the oil it carries, and only about 60 per cent. of the oil formerly used is required.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

### WASTE PICKER.

A waste picker for repicking the old waste shipped to the main shop from various points on the road is shown in Fig. 768. This device not only loosens up the waste but also removes the cinders and gravel. The cast iron cylinder, 18 in. in diameter, carries on its outside 16 rows of 3/8-in. teeth. The cylinder is inclosed in a galvanized iron casing, which has four rows of teeth which fall between those on the cylinder. Old waste is fed into the picker through the hopper at the top and after being thoroughly loosened and torn apart is discharged through the chute.—*K. J. Lamcool and J. S. Naery, Jr., Special Apprentices, Chicago, Indiana & Louisville, Lafayette, Ind.*

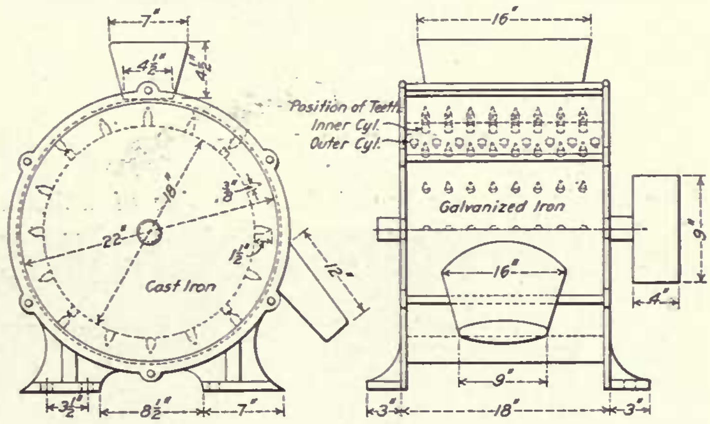



**Fig. 768—Waste Picker.**

# Paint Shop Kinks

PAINT SPRAYER.

A device for spraying paint over cars and locomotives is shown in Fig. 769. It consists of a nozzle discharging

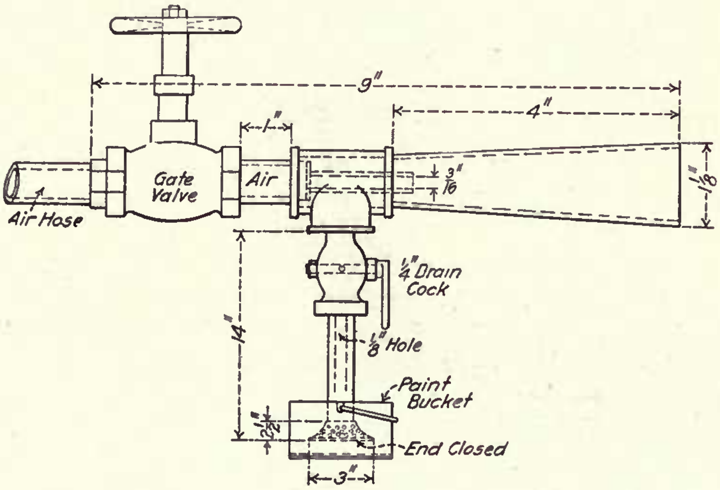



Fig. 769—Paint Sprayer.

from an air pipe in a funnel, into one side of which a pipe is admitted from the paint supply. This latter pipe has a strainer at its lower end which extends into the paint bucket. Admission of air to the nozzle creates an action similar to that of a locomotive injector, and the paint is siphoned up and sprayed over a considerable area as it leaves the funnel. The flow of paint is controlled by the ¼-in. cock and the air by the gate valve.—*F. C. Pickard, Cincinnati, Hamilton & Dayton, Indianapolis, Ind.*

DOOR RACK.

At the far end of the paint shop balcony is a door rack which is shown in Fig. 771. This rack affords a storage for 100 car doors, and utilizes a space which cannot be used to advantage for other purposes. The storage is compact, provides for the necessary air circulation and for a rapid and easy handling of the doors, as each is held independently. The drying of the doors is uniform and certain, assisted by the warm air from the heating system. The perspective drawing, Fig. 770, gives a better idea of the construction of the rack than does the

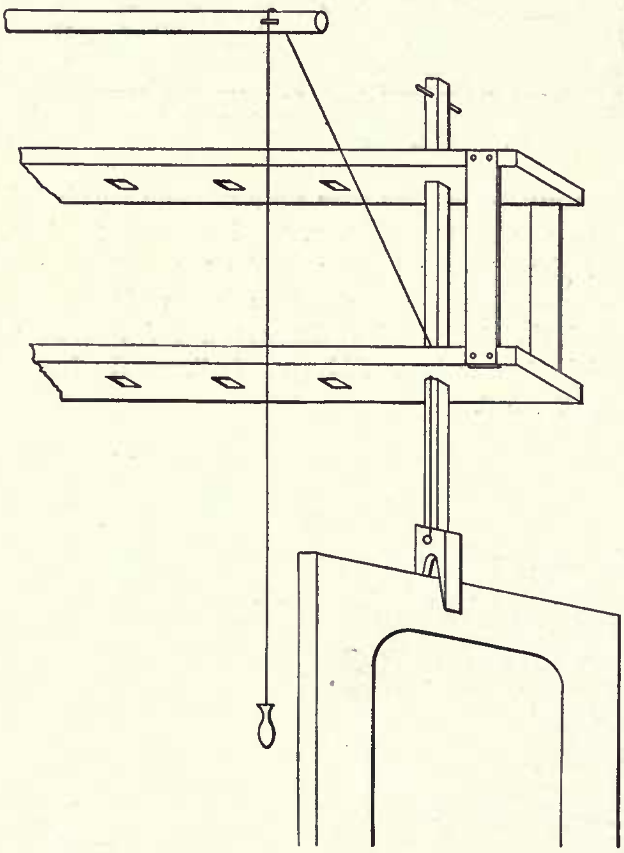


Fig. 770—Details of Top of Rack for Car Doors.

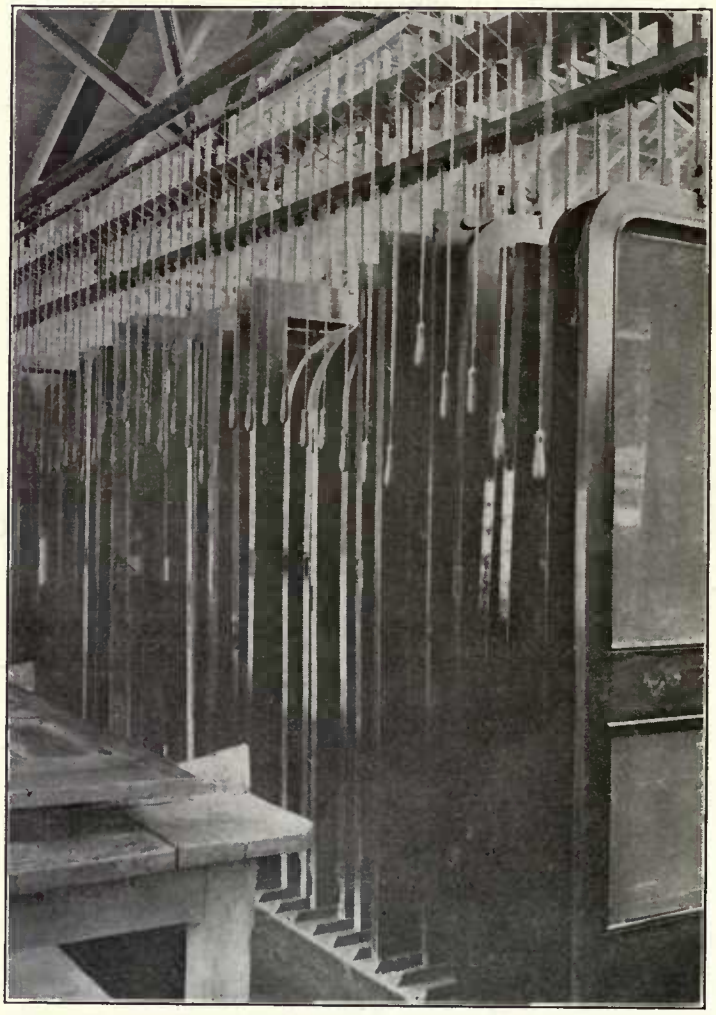


Fig. 771—Rack for Car Doors.

photograph. The holding piece is raised to its full upward position when placing a door, and then falls to the position shown by its own weight. The jaw, being tapered, does not mar the freshly painted or varnished surface.—*Lehigh Valley, Sayre, Pa.*

### PAINT BURNER.

The paint burner illustrated in Fig. 772 is designed to use kerosene oil, so as to eliminate dangerous gasolene burners from the shop buildings. A reservoir for the oil supply is connected to an air line for the necessary pressure for operation. As many burners as are desired can be operated from the one reservoir. These burners are very effective and are much preferred by the workmen to the gasolene torch. Beside the elimination of danger in the fuel, the burner is much lighter in weight

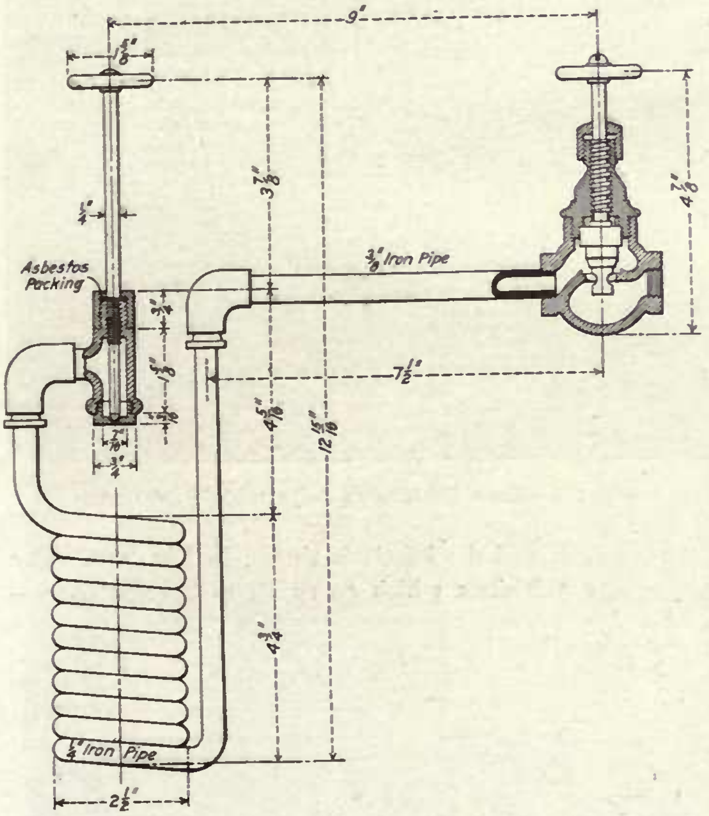



Fig. 772—Paint Burner for Passenger Cars.

and the fatigue to the workmen is lessened. Oil is admitted to the burner through the globe valve and passes through the coil and out through the opening controlled by the needle valve. The coil is first heated by a torch, thus vaporizing the oil which passes through it. The end of the needle valve is much sharper and longer than shown on the drawing. Sediment sometimes clogs the opening. If this occurs, turn the valve to increase the size of the opening, thus blowing out the obstruction. Air is used at about 60 lbs. pressure.—*F. S. Robbins, Inspector, Pennsylvania Railroad, Renora, Pa., and J. C. F. Kunkle, Foreman Painter.*

### PAINT SPRAYER.

A paint sprayer is used for painting freight cars. It saves greatly in labor, although the winds at Buffalo prevent any saving in material, if indeed they do not at times offset at least a part of the saving of labor. The operator realized that he was being timed when the fol-

Fig. 773—Painting a Car with the Spraying Machine.

lowing test was made, and it probably represents considerably better than average practice, although in order not to get the paint on too thick it is necessary for the

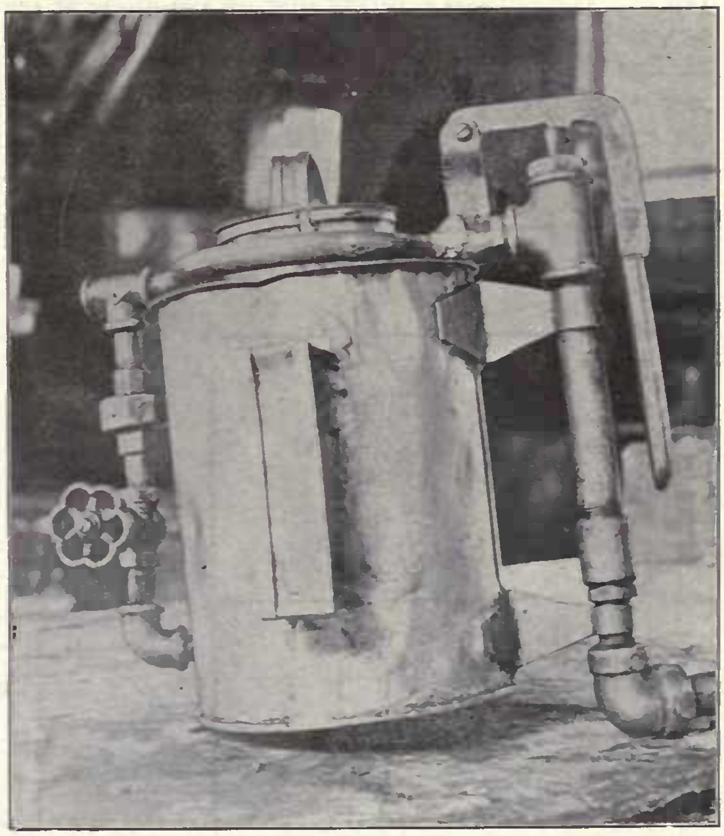


Fig. 774—Paint Sprayer Used for Painting Freight Cars.

operator to either keep moving or to shut off the device and stop. The time from when he started operations with a full can of paint (one gallon) until he had finished one side and one end of a 36-ft. 70,000-lb. capacity gondola car, inside height 3 ft. 11 in., was five minutes and ten seconds. This included the time for the partial refilling of the can of paint, which required 30 seconds, and also the touching up of two or three spots at the finish, which required about 20 seconds. The operator usually wears a mask over his nostrils. The car was thoroughly and evenly covered and only a few drops of paint dripped off. The paint seemed to have penetrated into all the cracks and crevices. The paint sprayer is shown in operation in Fig. 773.

The paint sprayer (Fig. 774) weighs about 6¾ lbs. when empty and 16 lbs. when filled. In addition, the weight of that part of the air hose which hangs from it must be considered. By pressing the handle at the side, air is admitted through a ½-in. pipe and siphons the paint from the bottom of the can out through the T. A spring automatically closes the valve when pressure is removed from the handle. The mixture of paint and air is forced out through the T on the ¼-in. pipe, no special nozzle being required. About three gallons of paint are required for the first coat on a new gondola car, such as described above.—*Erie Railroad, Buffalo, N. Y.*

### PAINT SPRAYER.

A simple and efficient paint spraying apparatus is shown in Fig. 775. The can is made of heavy galvanized iron, and the paint is introduced through the opening *A*, which when the can is in use is securely covered by the cap *C*. The cap has a rubber disk on the inside at the top, making the joint air-tight. A hose from the shop air line is connected at *B*. By opening the valve, which is controlled by the lever *H*, air is allowed to escape through the nozzle *G*, which is an ordinary ¼-in. T. As it rushes out it siphons the paint through the pipe, which is connected to the bottom of the oil can. The paint should be mixed sufficiently thin to flow freely. A handle *E* is attached to the side of the can for convenience in handling.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

### SASH RACK.

A sash rack which will accommodate the sash from a dozen cars at one time, together with the deck and

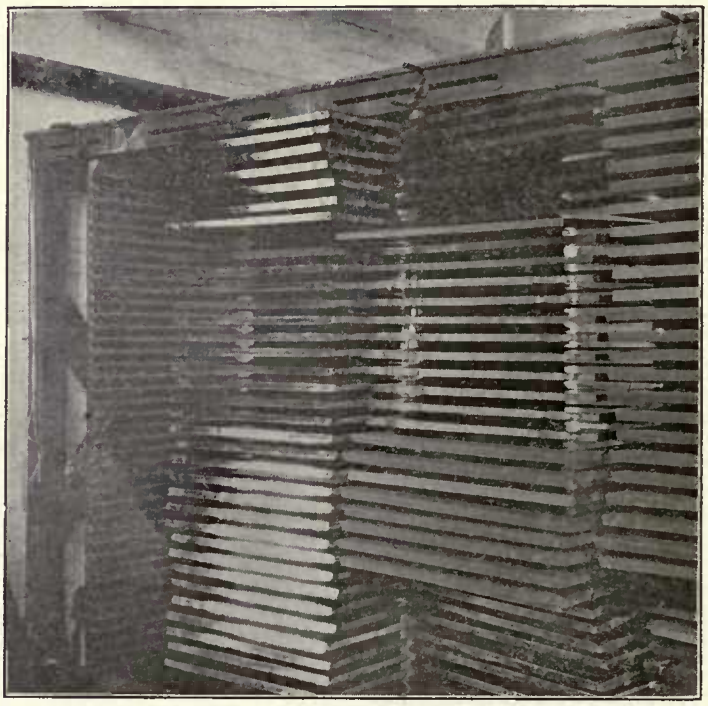


Fig. 776—Sash Rack with Adjustable Partitions.

transom sash and the blinds is shown in Fig. 776. The adjustable partitions which carry cleats beveled to pre-

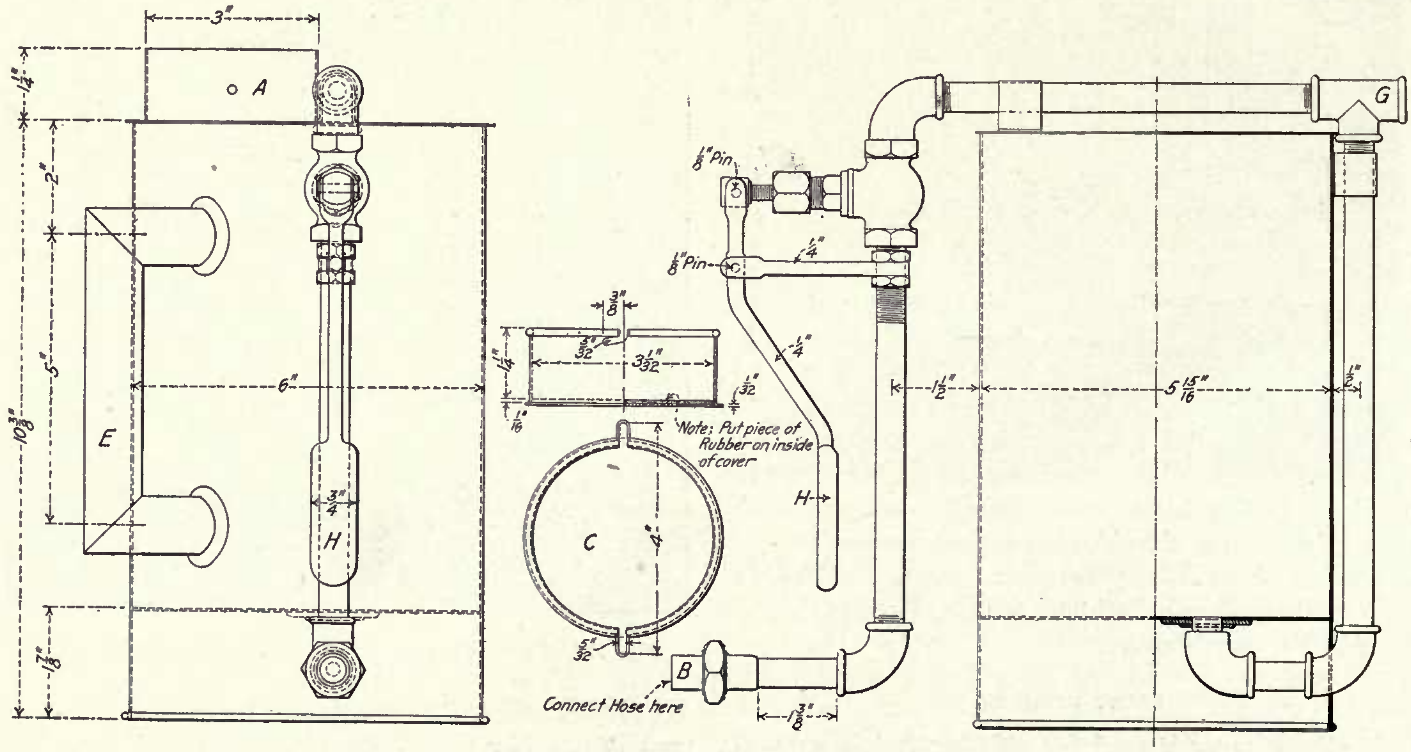



Fig. 775—Pneumatic Paint Sprayer.

vent marring the freshly applied paint or varnish, may be moved sidewise after loosening the winged holding clamps shown at the top. Similar clamps are provided at the bottom of the rack. Sash racks of this design afford a safe, clean and quick storage for sash and blinds, and allow the circulation of air for drying the fresh paint or varnish.—*Lehigh Valley, Sayre, Pa.*

PAINT STORAGE.

Paint is emptied from the barrels into 100-gallon tanks in the paint storage building. The barrel is rolled under a hoist in this building and is grasped at the ends by

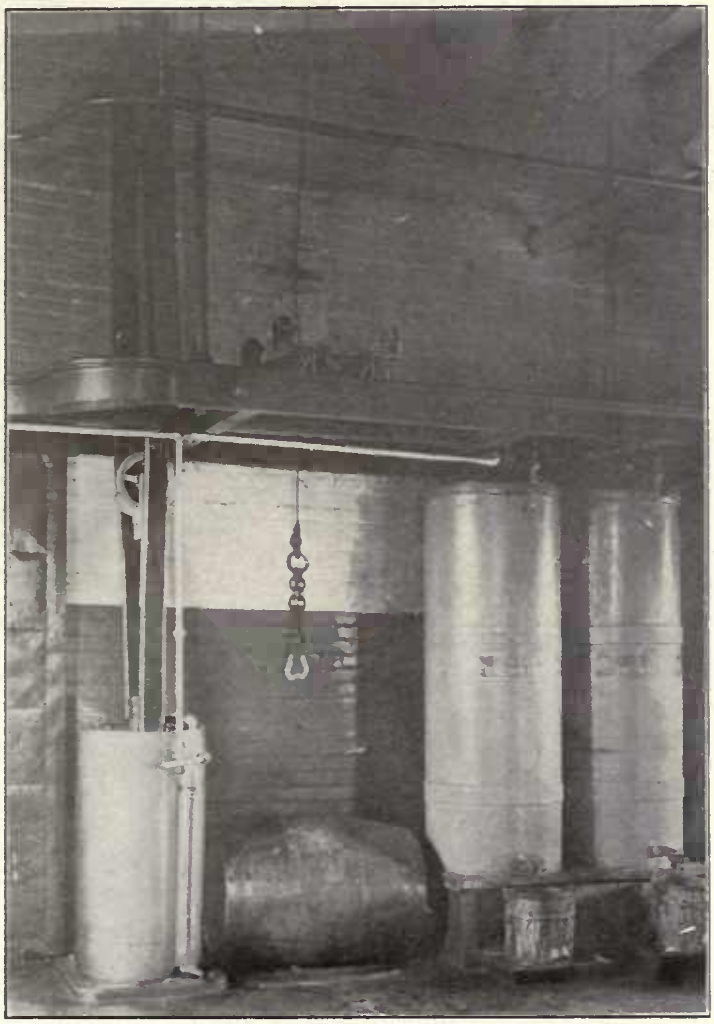


**Fig. 777—Paint Barrel Hoist.**

the hooks (Fig. 777) and is hoisted through an opening in the platform above. A specially designed truck, operating over rails on the platform, is run under the barrel, which is then lowered on the truck, resting on four rollers. The truck is moved over the tank in which the paint is to be emptied and the barrel is rolled on the four rollers until the bung is at the top. This is knocked out and the operator, holding a piece of waste over the hole, turns the barrel until the opening is just above the tank, when he removes the waste. The air cylinder for hoisting the barrels is 12 in. in diameter and has a stroke of 36 in. The platform is 8 ft. above the floor. The paint in the storage tanks is continually agitated, so as to be ready for use at all times, by the introduction of compressed air at the bottom of the tank through 3/16-in. holes spaced 5 in. apart in an air pipe.—*New York Central & Hudson River Car Shops, East Buffalo, N. Y.*

SASH, TABLE FOR PAINTING.

A simple, inexpensive table for painting window sash which greatly facilitates the handling of this class of work is shown in Fig. 778. The glass in the sash is

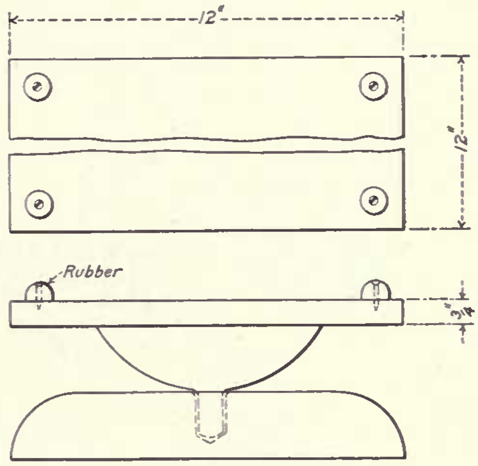



**Fig. 778—Table for Painting Window Sash.**

placed on the four rubber rests so that the woodwork does not come in contact with them. The stem of the top plate provides for revolving the sash so that the workman is not required to reach around it.—*Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.*

WATER COOLERS, REVOLVING STAND FOR PAINTING.

A revolving stand for painting water coolers is shown in Fig. 779. The bases are made from castings formerly

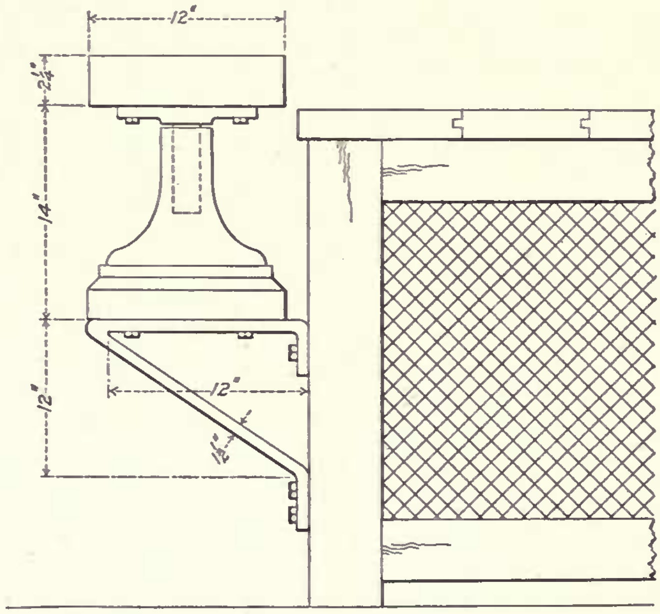



**Fig. 779—Revolving Stand for Painting Water Coolers.**

used in chair cars. The 12-in. diameter top is made to revolve, facilitating the painting. These stands are also used for any miscellaneous painting when it is advantageous to revolve the work.—*Lehigh Valley, Sayre, Pa.*

WHITEWASH SPRAYER, PNEUMATIC.

Large areas of wall space and roof in a roundhouse or shop can be quickly whitewashed by the use of the pneumatic sprayer shown in Fig. 780. It is made of an ordinary ¾-in. T, having an air nozzle, *A*, connected with an air line, projecting into one end. At the opposite end of the T is a discharge nozzle, *D*, which is flared out in order to spread the whitewash to the best advantage. The globe valve *G* has its construction modified so that the admission of air from the pipe *B* to the nozzle *A* may be controlled by means of the handle *E*. Air from the supply line is used at a pressure of from 75 to 100 lbs. per sq. in. The whitewash is siphoned up through the rubber hose, *H*, and is sprayed out through the nozzle, *D*. It is usually prepared in a barrel and is made quite thin, so as not to clog the hose. The air pipes are standard ½-in. pipe, and the various connections are of brass. An ordinary garden hose will answer for handling the whitewash.—*C. C. Leech, Foreman, Pennsylvania Railroad, Buffalo, N. Y.*

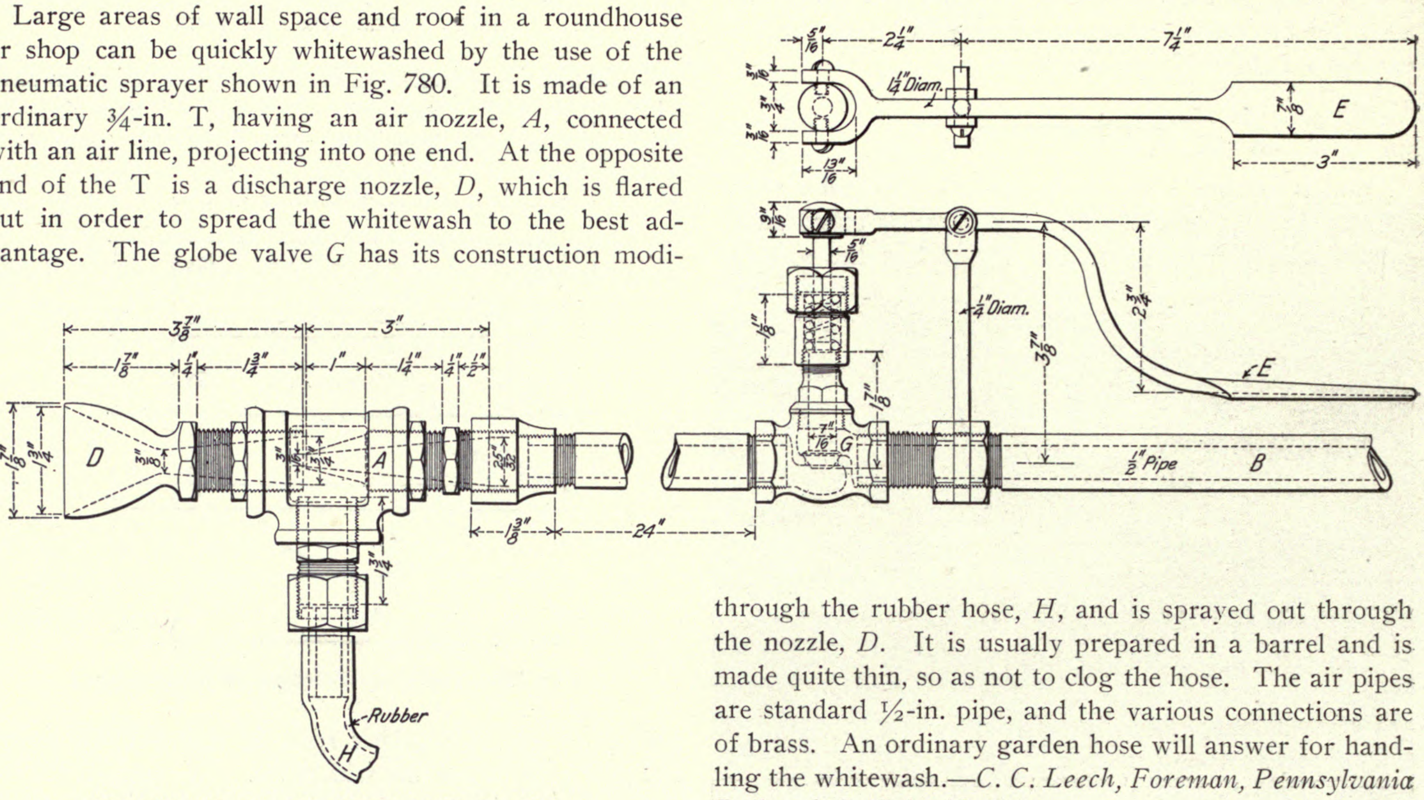



**Fig. 780—Pneumatic Whitewash Machine.**

# Miscellaneous Shop Kinks

AIR MOTOR, PNEUMATIC FEED FOR.

A pneumatic feed for air motors, *C*, is shown in Fig. 175, and in detail in Fig. 781. It has many uses and is especially adapted for drilling and tapping driving and truck wheel hubs for hub liners, and in drilling into the

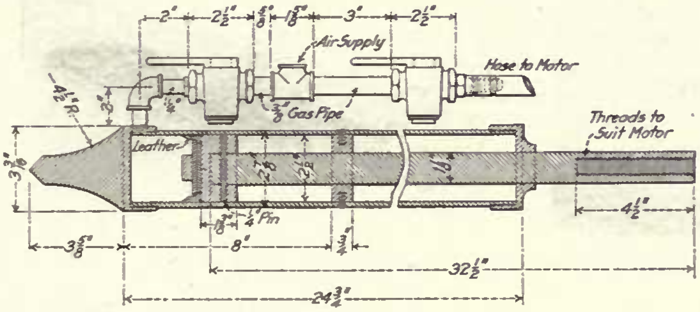



Fig. 781—Pneumatic Feed for Air Motor.

heads of tire retaining ring rivets preparatory to removing the ring and replacing the tire. The pressure on the piston gives a constant feeding pressure to the motor.—*M. H. Westbrook, Grand Trunk, Battle Creek, Mich.*

AIR MOTOR, SPEED REDUCER FOR.

A speed reducer used in connection with an air motor is shown in Fig. 782. This device is especially useful in

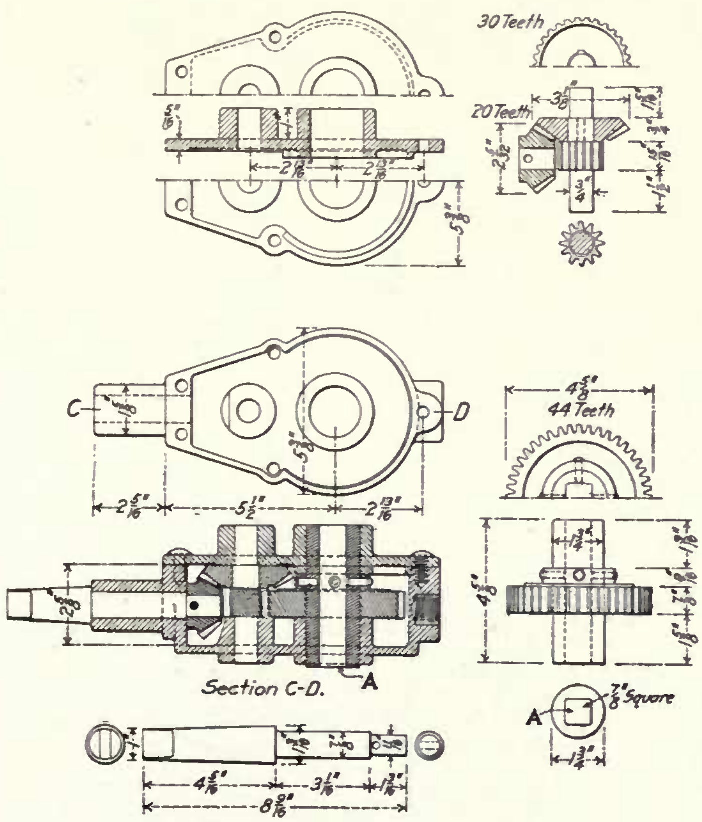



Fig. 782—Details of Speed Reducer for Air Motor.

reaming holes, as it is powerful and runs smoothly. It does not operate fast enough to burn the reamer, but makes a slight cut at every revolution. Large holes may be drilled easily with this device. It is also used to pull in valve or cylinder bushings when they are put in cold and are pulled in with a rod and nut. In this case it is necessary to have a hexagonal hole in the center gear the size of the nut used on the drawing-in rod. The machine is geared at a ratio of 5 to 1, and the bushing has to fit pretty tight to stall the machine, after it has once started.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

ASBESTOS GRINDER.

The device shown in Fig. 783 is easily and cheaply made and has proved very efficient for grinding old and broken magnesia or asbestos boiler lagging into a pulp. Both the upper and the lower boxes are made of wood.

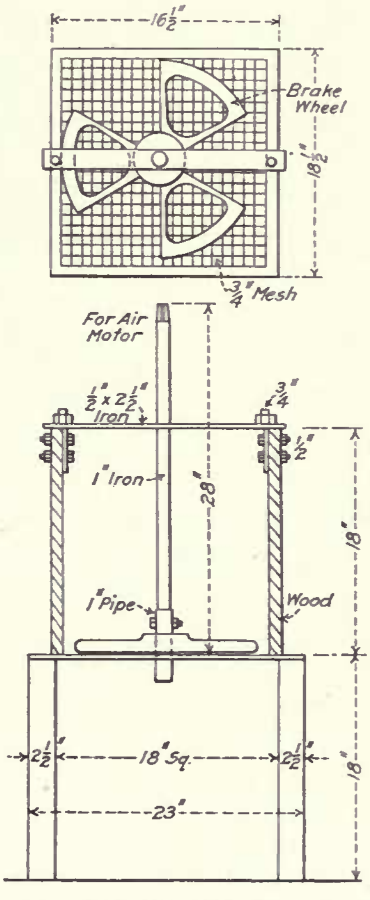



Fig. 783—Asbestos Grinder.

The division plate is thin sheet iron, perforated with ¾-in. square holes. The three-blade cutter is made from an old brake wheel, the cutting edges of which, being vertical, work in conjunction with the perforations in the plate in breaking up the lagging. An air motor is fitted to the upper end of the spindle and the lagging is fed into the top box.—*W. H. Snyder, Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.*

### BLUEPRINTS, TEMPLETS, JIGS, CARE OF.

One man does all the laying out for the shops and is in charge of all blueprints, jigs and templets. All blueprints and templets are kept in drawers, except frame templets, which are kept in a bin. Jigs are kept in pockets under the drawers. Everything is classified and numbered for easy selection, and on the outside of each case or bin is a list of the contents with the numbers.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

### BOYER SPEED RECORDER, TESTING.

A simple device for testing Boyer speed recorders is shown in Fig. 784. It consists of a small air engine, direct-connected to the flywheel of the speed recorder. An auxiliary tank and a reducing valve provide a constant air pressure, making it possible to maintain any constant speed of from one to 100 miles per hour. The pulley of the recorder turns ten times as many revolutions per minute as the number of miles per hour registered, that is, r.p.m. equals ten times m.p.h. For example, to check the recorder at 50 miles per hour it is only necessary to speed up the machine until the pulley turns 500 r.p.m. If the recorder is correct it will register the correct speed.—*Chicago & North Western, Chicago.*

### COUPLING, UNIVERSAL.

A universal coupling, or knuckle joint and socket, for use in reaming with an air motor when the latter cannot

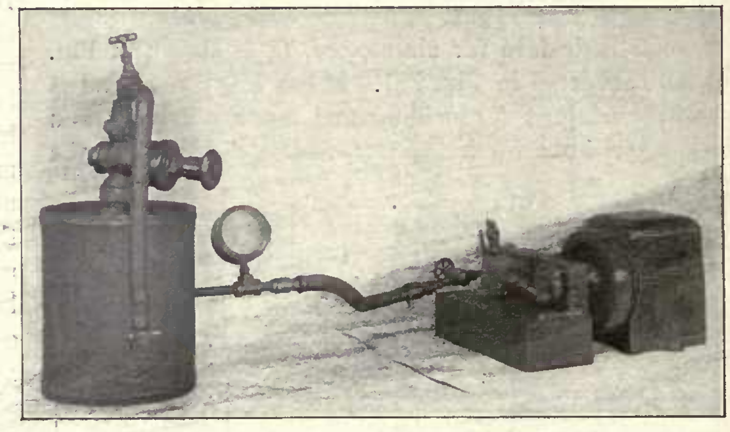


**Fig. 784—Device for Testing Boyer Speed Recorders.**

be used directly over the reamer is shown in Fig. 785. When drilling or reaming in close quarters, where there is not sufficient room to use the motor direct, one of these sockets with a knuckle joint will enable the motor to be used. Otherwise the work would have to be performed

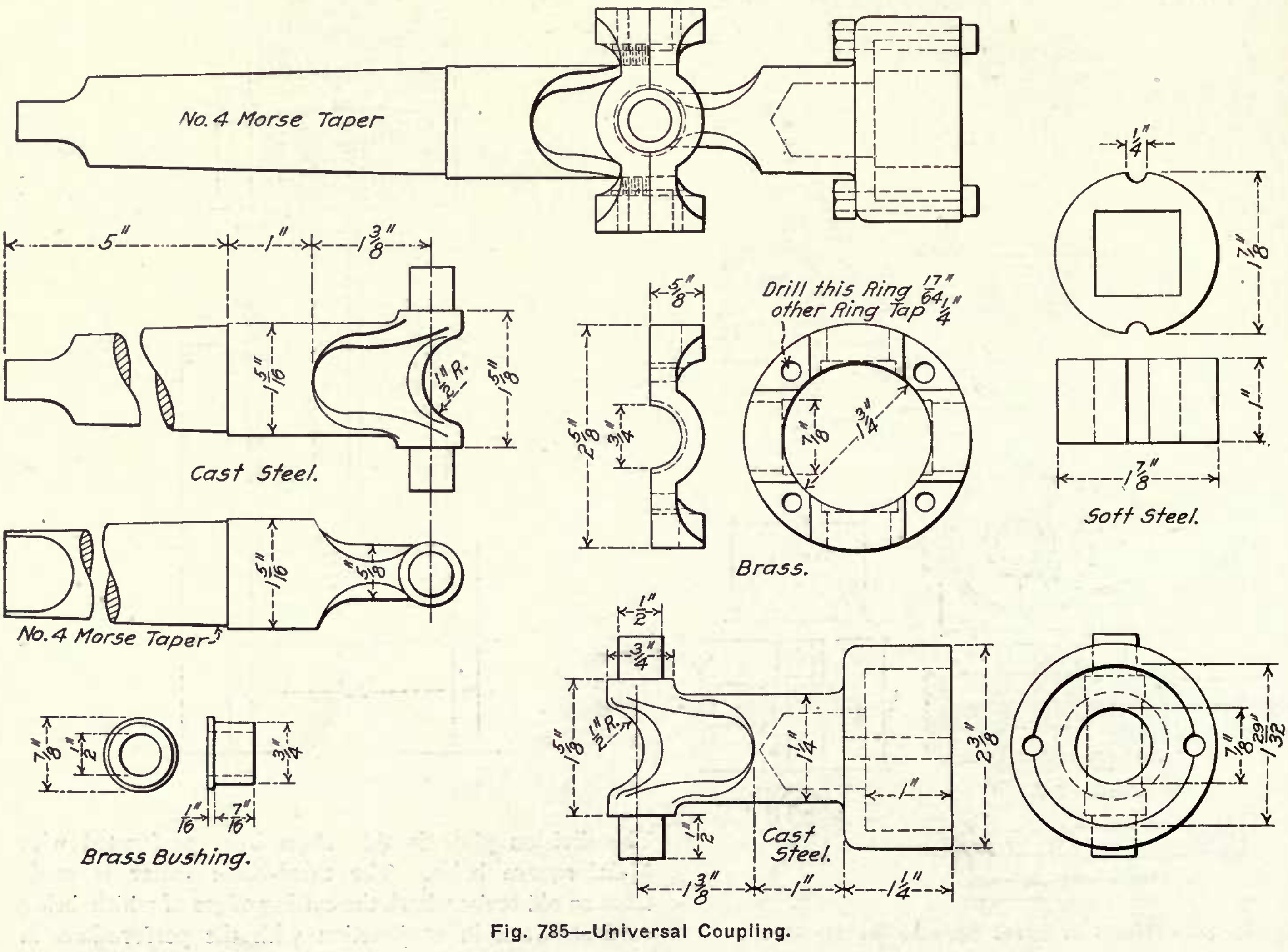



**Fig. 785—Universal Coupling.**

by hand, which is much slower and more expensive. One end of the knuckle joint is turned to the regular No. 4 Morse taper to fit the air motor, and the other end is an adjustable socket for all reamers. The socket is turned to receive steel centers, with square holes of different sizes for reamer shanks of various dimensions. These are held in place by two screws and are quickly removed or replaced. The device is of substantial construction, and has proved to be extremely useful and handy in shop work.—*E. J. McKernan, Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.*

### COUPLING, UNIVERSAL.

A universal coupling, which will be found valuable in connection with a tube cutter or tube roller when operated

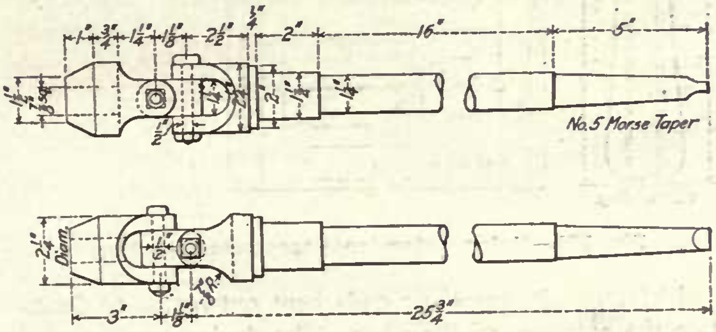



Fig. 786—Universal Coupling.

by an air motor near the shell of the boiler, or where there are obstructions which prevent the motor from being placed in line with the tool which it is driving, is shown in Fig. 786. The pins in the coupling are ½ in. in diameter.—*H. S. Rauch, Apprentice Instructor, New York Central & Hudson River, Oswego, N. Y.*

### CYLINDERS FOR AIR HOISTS, PREPARING.

A cheap and good way to prepare a piece of pipe for the cylinder of an air hoist or an air jack is shown in Fig. 787. Fill it about half full of sand and pieces of iron scrap; also two or three long pieces of round iron or

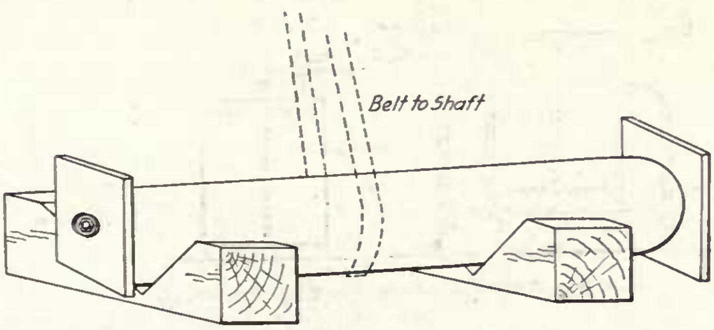



Fig. 787—Device for Finishing the Inside of a Cylinder for an Air Hoist.

pipe. Bolt a piece of wood over each end with a rod extending through the center as shown in the sketch; place the pipe on V blocks and revolve by running an old belt around the center and over the line shaft. The action of the sand and pieces of scrap on the inside will smooth and polish it nearly as perfectly as it can be bored on a machine. The long pieces of round iron wear down the ridges or high spots. Care should be taken to select pipe with as smooth an inside surface as possible. In one case in which the pipe was quite rough on the inside we used several pieces of round iron and pipe without any sand. After revolving the pipe one day the bumps and ridges were worn down. When once started in operation the device does not require attention and it may be run two or three days, or until the inside is perfectly smooth. We have finished the inside of both cast iron and wrought iron pipe from 48 in. to 84 in. long in this way.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

### CRATE FOR HANDLING MATERIAL.

An iron crate used for transporting small stock about the shop in quantities is shown in Fig. 788. The crate is shown hanging from the large traveling crane. This

Fig. 788—Metal Crate for Handling Material.

method of handling is especially efficient for small pieces, such as bolts, and may even be used advantageously for large pieces. A large number of crates are provided, so that they may be filled by the men doing the work on the pieces which saves extra handling.—*Lehigh Valley, Sayre, Pa.*

### DRINKING FOUNTAIN.

A drinking fountain, two of which are in the black-smith shop and a number of which are distributed through the other shops is shown in Fig. 789. The one in the photo is near the center aisle of the blacksmith shop, where it is easily accessible. The water used in these fountains is obtained by air pressure from a 300-ft. well on the shop grounds. The bowl is made of cast iron. The spigot on the feed pipe provides for filling buckets for general use.—*Central Railroad of New Jersey, Elizabethport, N. J.*

### ELECTRIC MOTOR EXTENSION RECEPTACLE AND PLUG.

Motor extension receptacles for portable tools are placed at every other pit, drawings of a receptacle and plug being reproduced in Fig. 790. They were designed by G. Willius, Jr., while mechanical engineer of the Great

**Fig. 789—Drinking Fountain.**

Northern. The device is designed to be used either with a two or three-wire circuit in order to prevent a reversal of polarity by the improper use of the plug, and to guard against short-circuiting. It is adapted for either indoor or outdoor use. The socket or receptacle has three spring blades arranged in triangular form, as shown by the end view, mounted on a block of slate secured to a metal base. Each blade is crimped about a third of the way from the outer end to fit into corresponding grooves in the plug in order to retain it, and the lower blade has an additional bend at its inner end to serve as a stop for the plug. The triangle is made irregular so that the plug can be inserted in only one way. The plug is made adjustable, as to contact, by having the fiber block at its upper end movable, to give any desired degree of bow to the blades. The receptacle is enclosed in a planished iron case lined with asbestos, arranged to be easily removed. The socket blades project through a triangular opening in the lower

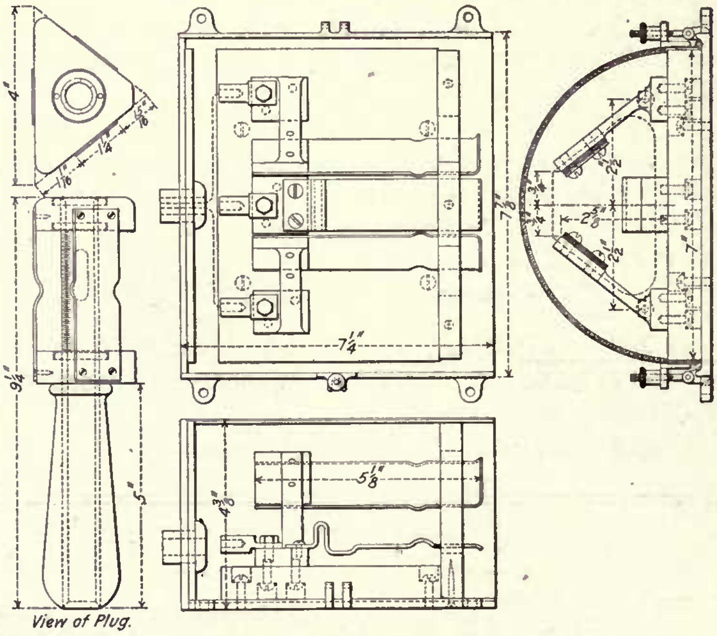



**Fig. 790—Motor Extension Receptacle and Plug.**

end plate, and have their ends bent outwardly to facilitate the entrance of the plug. The device may be used on a.c. or d.c. circuits, up to 600 volts.—*Great Northern, Dale Street Shops, St. Paul, Minn.*

### HEATER, GASOLENE.

A gasolene heating furnace, which consists of a stand with a basin filled with cement upon which the material to be heated is laid, with the gasolene torch burners on either side, is shown in Fig. 791. The gasolene is furnished from the tank underneath by being forced through

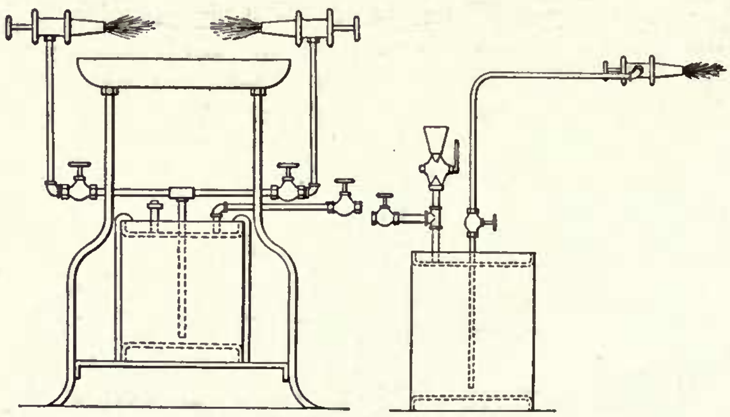


**Fig. 791—Gasolene Heating Furnaces.**

to the burners by air pressure, where the flow is regulated by a needle valve. The apparatus is portable, and connections can be made at any point with the air line of the shop. A modification is also shown of a similar burner which is used for heating plates or rods where the work has to be done in position. It can also be used for brazing purposes. Its operation is exceedingly simple. A reservoir about 9 in. in diameter and 14 in. long is fitted with a pipe at the top by which it can be filled and through which air is also admitted for pressure purposes. The pipe through which the gasolene is forced to the burner extends to within a short distance of the bottom of the tank, so that pressure applied to the upper surface of the liquid forces it to the burner.—*A. Lowe, Canadian Pacific Railway, Glen Yard, Westmount, Montreal.*

### HYDRAULIC JACK VALVE FACER.

A tool for refacing worn valves of hydraulic jacks is shown in Fig. 792. It consists of two steel blocks, held between the jaws of a vise and guided by the dowel pins. The cutting edges, indicated on the plan view, extend along the conical surface of the bore through the block, clearance being provided by filing a radius on each block, as shown. For facing, the valve is placed in the bore of the blocks and revolved by a screw driver attachment in

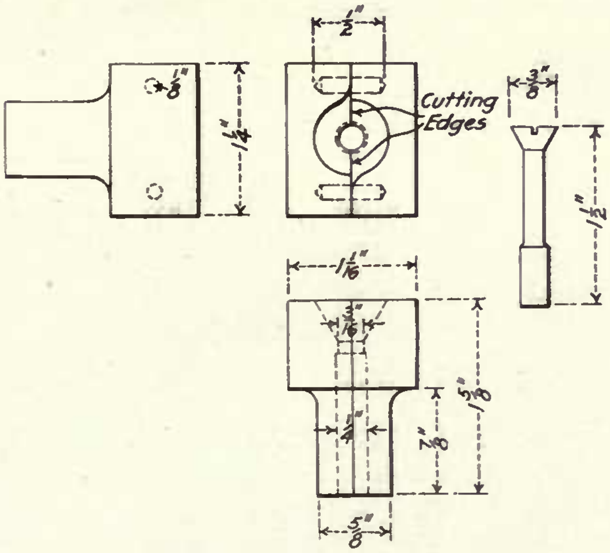



**Fig. 792—Hydraulic Jack Valve Facer.**

a breast drill. Only a few seconds are required to face a valve, which operation may be repeated four or five times before it is worn out.—*Fred Bentz, Tool Room Foreman, Southern Pacific, Bakersfield, Cal.*

### INJURED, FIRST AID TO.

A few years ago a number of the workmen decided to chip in and buy a few medical supplies, which were placed in charge of one of the young men in the office. When the matter was brought to the attention of the company it immediately undertook to supply the necessary material for "First Aid to the Injured." The men, however, have continued their support, the funds contributed by them being used for supplies for relieving such troubles as headache, earache, stomach troubles, etc., which do not properly come under the head of injuries. There is no question but what a case well filled with material for treating injuries, and in charge of men properly instructed as to its use, will pay for itself many times over in the course of a year, or even a few months, if the question is considered from a financial standpoint only. The cost is comparatively small and the effort is greatly appreciated by the men.—*Delaware, Lackawanna & Western, East Buffalo Car Shops, N. Y.*

### NUTS, LOCKING ON BOLTS.

A good scheme for locking nuts on bolts is shown in Fig. 793. All nuts are drilled in jigs so that the outside edge of the hole will just cut to the bottom of the thread. The nut is then screwed on the bolt, and after it is tight, or is in the desired position, the cutter *C*, which fits the hole in the nut, is driven into the hole cutting off the

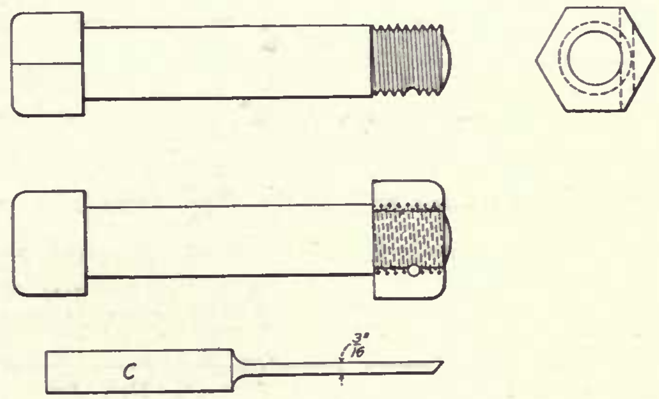



**Fig. 793—Device for Locking a Nut on a Bolt.**

exposed thread of the bolt. A piece of round iron is then driven through the hole and is bent over on each end. This positively locks the nut on the bolt and does not damage the bolt appreciably. The diameter of the hole is 3/16 in. for ¾ in., ⅞ in. and 1 in. nuts and ¼ in. for larger ones.—*Charles Maier, Engine House Foreman, West Jersey & Seashore, Atlantic City, N. J.*

### RADII, METHOD OF DETERMINING.

It is frequently necessary to obtain the radii of irregular parts of machinery, piping or patterns, and a templet of wood or cardboard is often used for this pur-

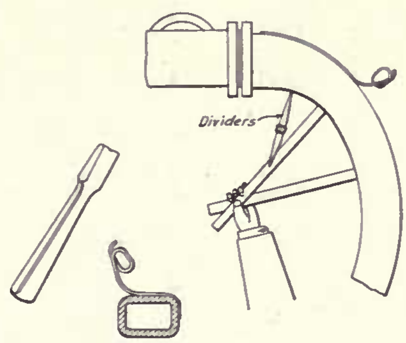



**Fig. 794—Method of Determining Radii.**

pose. An easier and more rapid method is to use a piece of soft solder or wire, especially when the work is small. Before using, the wire should be straightened and freed of kinks. A stick, shaped on the end, as shown, is then used to form the wire to the desired shape. The portion of the circle may then be laid off on any flat surface and the radius may easily be determined. The illustration, Fig. 794, shows wire used in this manner for obtaining the large radius of a steam pipe, and also for obtaining the small radius of the cross section.

Another method of obtaining the large radius of a steam pipe is also shown in the illustration. By this method it is possible to make a working sketch of such a pipe without removing it from the engine. Two pieces of wood are held, as shown, to form a steady support, which is easily obtainable by placing the points of contact at some distance from each other. A pair of dividers is then adjusted, supporting one leg on one of the sticks as indicated. By marking the points of contact at several different points along the pipe the required center may be obtained.—*C. V. Frisk, Chicago, Ill.*

RATES, TABLE OF.

These rate sheets are made up for each of the different hourly rates of wage paid at the shop, there being as many tables as there are rates. The foreman is supplied with as many rate sheets as he has rates of wages to be paid the men on his rolls. The time saved by this kink is very large, and it is perhaps of as much or more value than some of the mechanical kinks used in the shops. These rate sheets are now indispensable in the shop clerk's office.—*F. S. Robbins, Inspector, Pennsylvania Railroad, Renova, Pa.*

SHOP SURGEON.

The shop surgeon's office, with a complete hospital operating outfit, is located in the upper story of the shop office. It has been found a great benefit to have such facilities conveniently at hand. Accident cases receive immediate attention from the surgeon and chances for infection which often exist in a dirty shop are, in a great measure, obviated. The time ordinarily lost in going to a

P. R. R., ERIE DIVISION—WESTERN DIVISION—RENOVA SHOPS.

*Table of Rates—$0.169 Per Hour.*

No. R—977. Sheet C.

| 1 | | 50 | | 100 | | 150 | | 200 | | 250 | | 300 | | 350 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hrs. | Amount. | Hrs. | Amount. | Hrs. | Amount. | Hrs. | Amount. | Hrs. | Amount. | Hrs. | Amount. | Hrs. | Amount. | Hrs. | Amount. |
| 1 | $0.169 | 51 | $8.619 | 101 | $17.069 | 151 | $25.519 | 201 | $33.969 | 251 | $42.419 | 301 | $50.869 | 351 | $59.319 |
| 2 | .338 | 2 | 8.788 | 2 | 17.238 | 2 | 25.688 | 2 | 34.138 | 2 | 42.588 | 2 | 51.038 | 2 | 59.488 |
| 3 | .507 | 3 | 8.957 | 3 | 17.407 | 3 | 25.857 | 3 | 34.307 | 3 | 42.757 | 3 | 51.207 | 3 | 59.657 |
| 4 | .676 | 4 | 9.126 | 4 | 17.576 | 4 | 26.026 | 4 | 34.476 | 4 | 42.926 | 4 | 51.376 | 4 | 59.826 |
| 5 | .845 | 5 | 9.295 | 5 | 17.745 | 5 | 26.195 | 5 | 34.645 | 5 | 43.095 | 5 | 51.545 | 5 | 59.995 |
| 6 | 1.014 | 6 | 9.464 | 6 | 17.914 | 6 | 26.364 | 6 | 34.814 | 6 | 43.264 | 6 | 51.714 | 6 | 60.164 |
| 7 | 1.183 | 7 | 9.633 | 7 | 18.083 | 7 | 26.533 | 7 | 34.983 | 7 | 43.433 | 7 | 51.883 | 7 | 60.333 |
| 8 | 1.352 | 8 | 9.802 | 8 | 18.252 | 8 | 26.702 | 8 | 35.152 | 8 | 43.602 | 8 | 52.052 | 8 | 60.502 |
| 9 | 1.521 | 9 | 9.971 | 9 | 18.421 | 9 | 26.871 | 9 | 35.321 | 9 | 43.771 | 9 | 52.221 | 9 | 60.671 |
| 10 | 1.690 | 60 | 10.140 | 110 | 18.590 | 160 | 27.040 | 210 | 35.490 | 260 | 43.940 | 310 | 52.390 | 360 | 60.840 |
| 1 | 1.859 | 1 | 10.309 | 1 | 18.759 | 1 | 27.209 | 1 | 35.659 | 1 | 44.109 | 1 | 52.559 | 1 | 61.009 |
| 2 | 2.028 | 2 | 10.478 | 2 | 18.928 | 2 | 27.378 | 2 | 35.828 | 2 | 44.278 | 2 | 52.728 | 2 | 61.178 |
| 3 | 2.197 | 3 | 10.647 | 3 | 19.097 | 3 | 27.547 | 3 | 35.997 | 3 | 44.447 | 3 | 52.897 | 3 | 61.347 |
| 4 | 2.366 | 4 | 10.816 | 4 | 19.266 | 4 | 27.716 | 4 | 36.166 | 4 | 44.616 | 4 | 53.066 | 4 | 61.516 |
| 5 | 2.535 | 5 | 10.985 | 5 | 19.435 | 5 | 27.885 | 5 | 36.335 | 5 | 44.785 | 5 | 53.235 | 5 | 61.685 |
| 6 | 2.704 | 6 | 11.154 | 6 | 19.604 | 6 | 28.054 | 6 | 36.504 | 6 | 44.954 | 6 | 53.404 | 6 | 61.854 |
| 7 | 2.873 | 7 | 11.323 | 7 | 19.773 | 7 | 28.223 | 7 | 36.673 | 7 | 45.123 | 7 | 53.573 | 7 | 62.023 |
| 8 | 3.042 | 8 | 11.492 | 8 | 19.942 | 8 | 28.392 | 8 | 36.842 | 8 | 45.292 | 8 | 53.742 | 8 | 62.192 |
| 9 | 3.211 | 9 | 11.661 | 9 | 20.111 | 9 | 28.561 | 9 | 37.011 | 9 | 45.461 | 9 | 53.911 | 9 | 62.361 |
| 20 | 3.380 | 70 | 11.830 | 120 | 20.280 | 170 | 28.730 | 220 | 37.180 | 270 | 45.630 | 320 | 54.080 | 370 | 62.530 |
| 1 | 3.549 | 1 | 11.999 | 1 | 20.449 | 1 | 28.899 | 1 | 37.349 | 1 | 45.799 | 1 | 54.249 | 1 | 62.699 |
| 2 | 3.718 | 2 | 12.168 | 2 | 20.618 | 2 | 29.068 | 2 | 37.518 | 2 | 45.968 | 2 | 54.418 | 2 | 62.868 |
| 3 | 3.887 | 3 | 12.337 | 3 | 20.787 | 3 | 29.237 | 3 | 37.687 | 3 | 46.137 | 3 | 54.587 | 3 | 63.037 |
| 4 | 4.056 | 4 | 12.506 | 4 | 20.956 | 4 | 29.406 | 4 | 37.856 | 4 | 46.306 | 4 | 54.756 | 4 | 63.206 |
| 5 | 4.225 | 5 | 12.675 | 5 | 21.125 | 5 | 29.575 | 5 | 38.025 | 5 | 46.475 | 5 | 54.925 | 5 | 63.375 |
| 6 | 4.394 | 6 | 12.844 | 6 | 21.294 | 6 | 29.744 | 6 | 38.194 | 6 | 46.644 | 6 | 55.094 | 6 | 63.544 |
| 7 | 4.563 | 7 | 13.013 | 7 | 21.463 | 7 | 29.913 | 7 | 38.363 | 7 | 46.813 | 7 | 55.263 | 7 | 63.713 |
| 8 | 4.732 | 8 | 13.182 | 8 | 21.632 | 8 | 30.082 | 8 | 38.532 | 8 | 46.982 | 8 | 55.432 | 8 | 63.882 |
| 9 | 4.901 | 9 | 13.351 | 9 | 21.801 | 9 | 30.251 | 9 | 38.701 | 9 | 47.151 | 9 | 55.601 | 9 | 64.051 |
| 30 | 5.070 | 80 | 13.520 | 130 | 21.970 | 180 | 30.420 | 230 | 38.870 | 280 | 47.320 | 330 | 55.770 | 380 | 64.220 |
| 1 | 5.239 | 1 | 13.689 | 1 | 22.139 | 1 | 30.589 | 1 | 39.039 | 1 | 47.489 | 1 | 55.939 | 1 | 64.389 |
| 2 | 5.408 | 2 | 13.858 | 2 | 22.308 | 2 | 30.758 | 2 | 39.208 | 2 | 47.658 | 2 | 56.108 | 2 | 64.558 |
| 3 | 5.577 | 3 | 14.027 | 3 | 22.477 | 3 | 30.927 | 3 | 39.377 | 3 | 47.827 | 3 | 56.277 | 3 | 64.727 |
| 4 | 5.746 | 4 | 14.196 | 4 | 22.646 | 4 | 31.096 | 4 | 39.546 | 4 | 47.996 | 4 | 56.446 | 4 | 64.896 |
| 5 | 5.915 | 5 | 14.365 | 5 | 22.815 | 5 | 31.265 | 5 | 39.715 | 5 | 48.165 | 5 | 56.615 | 5 | 65.065 |
| 6 | 6.084 | 6 | 14.534 | 6 | 22.984 | 6 | 31.434 | 6 | 39.884 | 6 | 48.334 | 6 | 56.784 | 6 | 65.234 |
| 7 | 6.253 | 7 | 14.703 | 7 | 23.153 | 7 | 31.603 | 7 | 40.053 | 7 | 48.503 | 7 | 56.953 | 7 | 65.403 |
| 8 | 6.422 | 8 | 14.872 | 8 | 23.322 | 8 | 31.772 | 8 | 40.222 | 8 | 48.672 | 8 | 57.122 | 8 | 65.572 |
| 9 | 6.591 | 9 | 15.041 | 9 | 23.491 | 9 | 31.941 | 9 | 40.391 | 9 | 48.841 | 9 | 57.291 | 9 | 65.741 |
| 40 | 6.760 | 90 | 15.210 | 140 | 23.660 | 190 | 32.110 | 240 | 40.560 | 290 | 49.010 | 340 | 57.460 | 390 | 65.910 |
| 1 | 6.929 | 1 | 15.379 | 1 | 23.829 | 1 | 32.279 | 1 | 40.729 | 1 | 49.179 | 1 | 57.629 | 1 | 66.079 |
| 2 | 7.098 | 2 | 15.548 | 2 | 23.998 | 2 | 32.448 | 2 | 40.898 | 2 | 49.348 | 2 | 57.798 | 2 | 66.248 |
| 3 | 7.267 | 3 | 15.717 | 3 | 24.167 | 3 | 32.617 | 3 | 41.067 | 3 | 49.517 | 3 | 57.967 | 3 | 66.417 |
| 4 | 7.436 | 4 | 15.886 | 4 | 24.336 | 4 | 32.786 | 4 | 41.236 | 4 | 49.686 | 4 | 58.136 | 4 | 66.586 |
| 5 | 7.605 | 5 | 16.055 | 5 | 24.505 | 5 | 32.955 | 5 | 41.405 | 5 | 49.855 | 5 | 58.305 | 5 | 66.755 |
| 6 | 7.774 | 6 | 16.224 | 6 | 24.674 | 6 | 33.124 | 6 | 41.574 | 6 | 50.024 | 6 | 58.474 | 6 | 66.924 |
| 7 | 7.943 | 7 | 16.393 | 7 | 24.843 | 7 | 33.293 | 7 | 41.743 | 7 | 50.193 | 7 | 58.643 | 7 | 67.093 |
| 8 | 8.112 | 8 | 16.562 | 8 | 25.012 | 8 | 33.462 | 8 | 41.912 | 8 | 50.362 | 8 | 58.812 | 8 | 67.262 |
| 9 | 8.281 | 9 | 16.731 | 9 | 25.181 | 9 | 33.631 | 9 | 42.081 | 9 | 50.531 | 9 | 58.981 | 9 | 67.431 |
| 50 | 8.450 | 100 | 16.900 | 150 | 25.350 | 200 | 33.800 | 250 | 42.250 | 300 | 50.700 | 350 | 59.150 | 400 | 67.600 |

doctor's office, and the often long wait there, are also avoided. An important part of the shop surgeon's duty is to make an investigation of shop accidents with a view to recommending safeguards to prevent their recurrence. The surgeon makes a study of safety appliance laws and inspects and criticizes the shops with a view of complying with these laws. Sanitary conditions are also kept under constant inspection and intelligent suggestions are made where improvements are thought necessary. The surgeon also formulates laws regulating the workman's presence at the plant if contagious diseases exist at his home; if suspicious cases of tuberculosis are found a proper decision as to their disposal is made. —*Lake Shore & Michigan Southern, Collinwood, Ohio.*

### STORAGE RACK FOR STEEL BARS.

The material rack for storing steel rods and bars, shown in Fig. 795, is better built and more substantial than racks ordinarily used for this purpose. It is 40 ft. wide and about 17 ft. deep and rests on concrete piers, there being five of these extending the full width of the rack. The cast iron uprights are about 9 ft. high and are spaced 2 ft. center to center at the front of the rack and about 4 ft. 3 in. center to center crosswise. These cast iron standards are about 1½ in. x 5 in. in section, with ribs at the middle of each side, making the maximum width at the bosses 4 in., tapering down to a minimum of 2½ in. midway between the cross rods. The 1⅛-in. cross rods have pipe spacers on which the material rests. The cross rods are spaced vertically about 1 ft. center to center, except for the lower one, which is 18 in. above the base, and the upper one, which is 6 in. below the under side of the top timber. It will be seen that the two upper rows are divided into smaller width sections by the use of pieces of ½ in. x 2 ½ in. iron placed midway between the cast iron posts. The rack is tied at the sides by two sets of diagonals of 4 in. x ½ in. iron; one set of these is shown in a partial side and end view of the rack, Fig. 796. The timbers used at the top and bottom to tie the structure together are 5 in. x 8 in. It is the intention to cover the rack over to protect the material from the weather.—*Erie Railroad, Buffalo, N. Y.*

**Fig. 795—Partial View of Steel Storage Rack.**

**Fig. 796—Partial Side and End View of Storage Rack.**

### VALVE LOCK.

It is often desirable to have valves outside of buildings locked. This is particularly true where it is necessary to

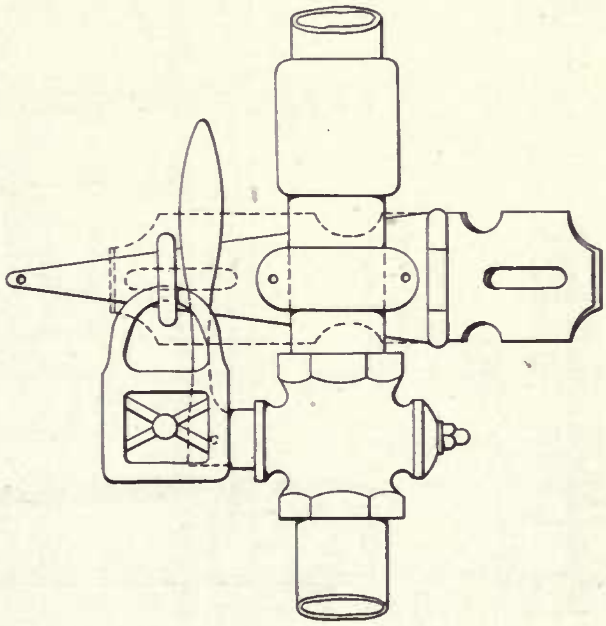


**Fig. 797—Device for Locking Valves.**

store large quantities of oil, gasolene or other inflammable material outside and away from the building for safety. In such cases the usual practice is to build a housing about the valve and provide a lock for the door, or opening, in the housing. A much simpler arrangement, and one which has proved satisfactory, is illustrated in Fig. 797. The full lines in the sketch show the hasp in an open position, while the dotted lines show it closed.—*A. G. Pancost, Elkhart, Ind.*

### TRANSFER TABLE, LOW.

A deep pit for a transfer table is usually very much of a nuisance, and this is particularly true where it is necessary to locate it within the walls of the building. A table, by the use of which the depth is reduced to 13 in. below the top of the rail, is shown in the illustration, Fig. 798. It is formed of I beams, on which the running rails rest and which are used as girders for the table. They are practically suspended from the journals of the carrying wheels. The table has a width suitable for two tracks and is also provided with spools or drums for hauling cars. It is braced and held square by diagonal tension braces, as shown, and runs on six rails, one-half of the table only being shown in the engraving. It would, of course, be possible to fit it with electric motors by an extension of one of the end axles, so as to run the whole length of the machine, and placing the electric drive on the floor at a level with the rails. The I beams used are 7 in. deep.

### WHEEL PRESS, HAND CAR.

The device for pressing on hand car wheels, shown in Fig. 799, has a long bar in the center, resting on jack screws to provide for adjustment. A V is cut on the top of the bar and the axle clamps loosely to it, so that it will slide while pressing on the wheels. As the wheels are pressed on by the ratchet jack this bar and the clamps prevent the axle from springing. The device for removing the wheels, also shown in Fig. 799, is made from old pieces of engine frame. These pieces are set in blocks of the proper height. The forgings are held together with 1¾-in. bolts with 3-in. thimbles between. One forging is arranged to take a 2½-in. ratchet jack which is forced against the end of the axle; the other

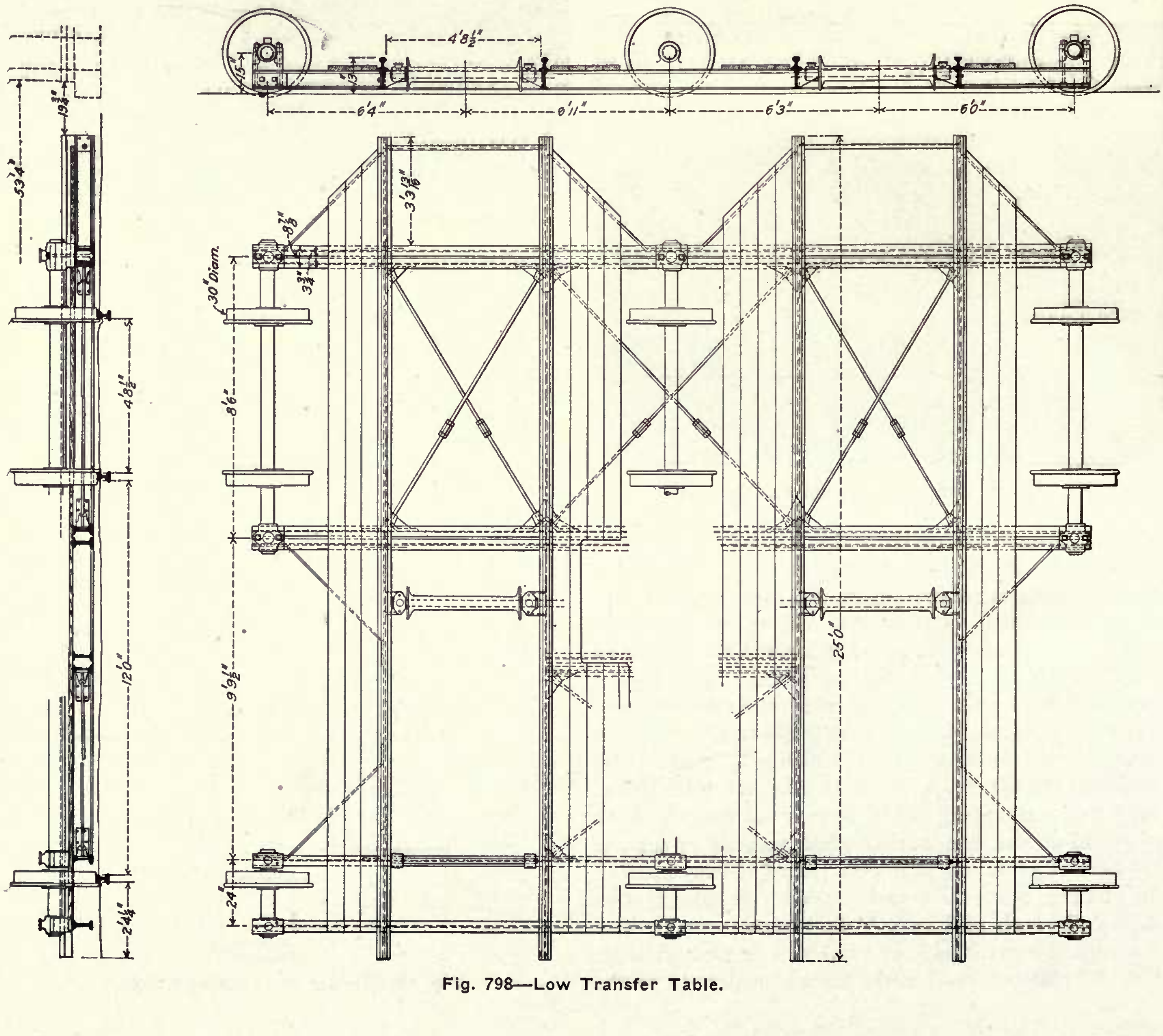



Fig. 798—Low Transfer Table.

forging is cut out opposite the hole for the screw so that the axle may rest in it. The forging is cut to take the largest axles and for the smaller ones a V-shaped collar may be slipped in between it and the axle. The screw jack does not fit directly against the axle but bears against a pin or block, which is a little smaller in diameter than the axle.—*C. J. Crowley, Piece Work Inspector, Chicago, Burlington & Quincy, West Burlington, Iowa.*

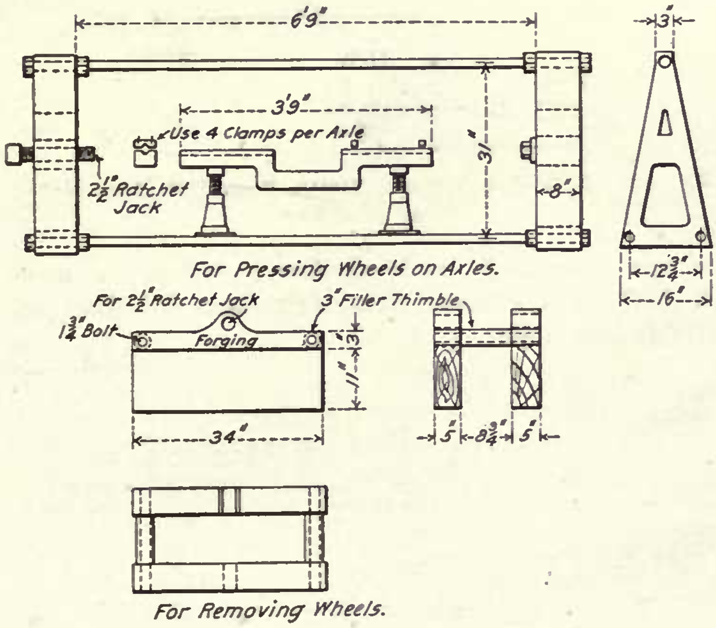



**Fig. 799—Hand Car Wheel Presses.**

WATER SUPPLY, IMPROVING.

We had considerable trouble with the water supply from the main water pipe to the ½-in. faucets in the shops. This was due to the fact that the main water pipe runs parallel and close to the main steam pipe, and also because the water main was tapped at the top. After opening the faucets we would obtain dirty and greasy water. The method of taking the supply from the main water pipe was changed, as shown in the accompanying sketch, Fig. 800, thus overcoming the difficulty.—*Frank J. Borer, Foreman Air Brake Department, Central Railroad of New Jersey, Elizabethport, N. J.*

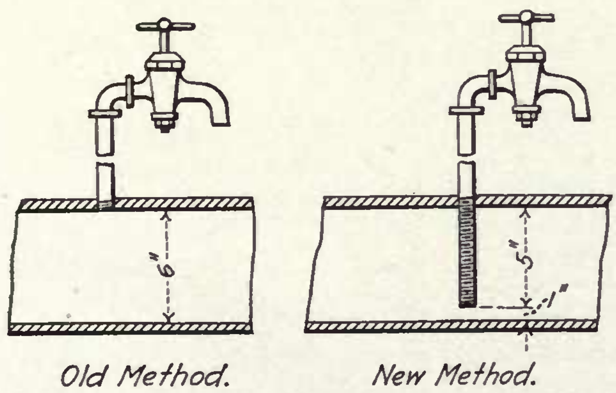



**Fig. 800—Improving the Water Supply to the Shop Faucets.**

WINDOWS, CLEANING.

A simple method of cleaning shop windows with the aid of an air motor is shown in Fig. 801. A stiff brush is held in the socket of the motor and, after dipping in benzine, is run over the window glass. A soft, dry brush is used for polishing after the glass has dried.—*James Stevenson, Foreman Pennsylvania Railroad, Olean, N. Y.*

**Fig. 801—Cleaning Shop Windows.**

WINDOWS, PNEUMATIC APPARATUS FOR OPERATING.

An arrangement for opening and closing shop windows by compressed air is shown in the accompanying illustration, Fig. 802. It consists of an air cylinder 18 in. long, made of 3½-in. pipe, a long 1⅜-in. bar and the necessary connections. The cylinder rests on a pin which

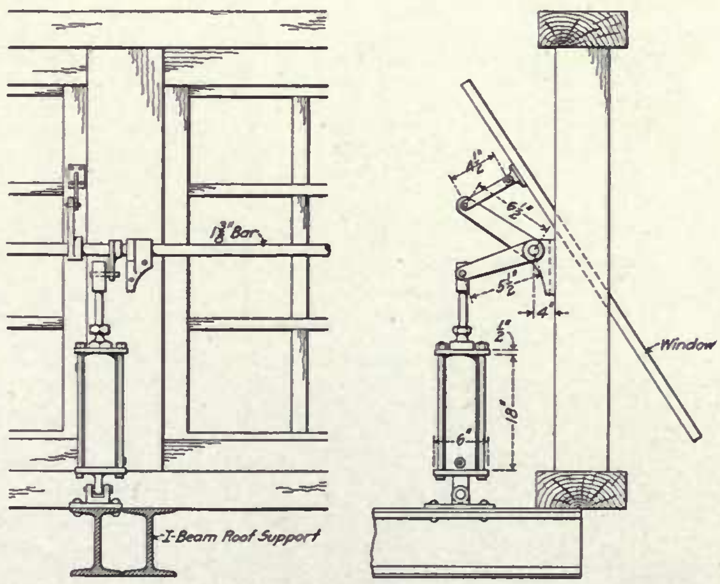



**Fig. 802—Apparatus for Opening and Closing Windows by Compressed Air.**

allows it to swing when turning the rod. The rod extends the length of the shop, being connected to the windows by the lever arms, as shown. There are ⅜-in. air connections at the top and bottom of the cylinder to lower and raise the piston when desired. This arrangement is used in the shop power house of the Central Railroad of New Jersey at Ashley, Pa. It operates sixteen windows, and without a doubt could handle three or four times as many. It was designed by A. M. Zwiebel, who is employed at the Ashley shops.

WRENCH, SOCKET.

With the wrench shown in Fig. 803 it is not necessary to use a lever bar to tighten up a nut. The wrench is so designed that good leverage can be obtained by grasping the projections extending beyond the bends. Wrenches

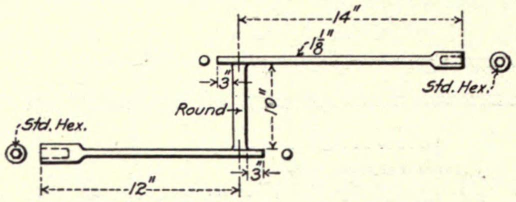



**Fig. 803—A Socket Wrench Which Does Not Require the Use of a Bar.**

of this kind can be made all sizes to suit any work.—*H. L. Burrhus, Assistant General Foreman, Erie Railroad, Susquehanna, Pa.*

# INDEX