"Shop Talk"

FIRST NUMBER OF THE SECOND VOLUME.
JANUARY, 1902.

The New Draper Lathes.

HE NEW type Draper Lathe has been designed especially to withstand the heaviest duty, and to meet the conditions called for by the new process tool steels which by their improved quality have made demands upon lathes, both in regard to power and feeds, not thought possible a few years ago; at the same time nothing has been sacrificed to convenience in operating; in fact the improvements tend to increase the facility with which the necessary operative changes can be made.

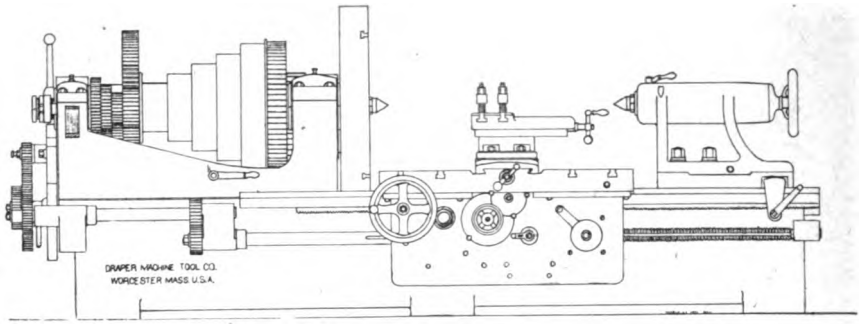
The driving mechanism is very substantial, the cones being in all cases of large diameter and wide face; the back gearing is of wide face and coarse pitch; the ratio of gearing is large and is so proportioned that an even graduation of speeds from the fast to the slow is obtained.

The live spindles are made of hammered crucible steel with bearings large in diameter and of good length, ground with extreme care on special grinding machines and are true cylinders. The boxes in the head are of the best quality of bearing bronze with round seats, supported almost the entire length in the massive head frame, and are fitted into the head with the same care as the running bearing, resulting in the absence of vibration in the work when taking the broad smoothing cuts which are a feature of these tools.

The tail stock is massive, has long bearing on the bed, can be securely bolted when in use and has side adjustment for taper work. The spindle is of large diameter, and the tool steel centers in both head and tail spindles are of large diameter, fitted in long taper holes by grinding, and are concentric with the spindles.

The carriage has long bearings on Vees of ample size, giving extreme wearing surface, and are gibbed to the outside of the bed front and back. The compound rest is sufficiently rigid to support the tools, and the large size lathes are provided with double fastenings for the tool. Angular feed to the tool slide can be furnished if desired. The Taper Attachment is so designed that there is no loss of rigidity over the regular rest, it being operated without the addition of the usual supplementary cross slide.

The feed mechanism is also of very massive construction. Commencing at he rear end of the live spindle is a nest of six gears, any pair of which may be operatively connected to the feed stud by the medium of a sliding feather and rod, giving three different pitches of screws of the ratio ½, 1 and 2 to 1, also of feeds without changing any gears. At the outside of the head on sector plate the change gears are arranged to compound n any desired ratio, and the change from



Draper Triple Geared 38 in. Lathe.

simple to compound gearing is made almost instantly, giving the operator six pitches of screws or six different feeds. The sector plate with its studs and change gearing is of such massive construction that there can be no harmful motion under the most severe duty. The lead screw is of special steel made expressly for screws, has high wearing qualities, and the master screw from which they are made is of acknowledged accuracy. These screws are of large diameter, ½" pitch, and are splined for feeding purposes, the thread being used only for screw cutting. The apron is so constructed that all shafts with heavy duty are supported in double bearings with the gears between same. The bevel gears are supported in substantial brackets and large quill bearings. The pinions are all steel with bronze bushings where running on steel shafts, and all the gearing is of wide face and coarse pitch. Clutches are provided to reverse the direction of feed at the apron, thus avoiding the shifting of bevel gears from the proper mesh with engaging gear. The cross and lateral feeds are operated by the same friction, through the medium of clutches. Pulling the friction hand wheel forward away from the apron engages the lateral feed, the reverse of this operation engages the cross feed. The amount of motion is such that each clutch is entirely out of mesh with its mate before the opposite pair engages. Advantage is taken of this to combine with the open and shut nut a very effective lock, preventing the engagement of more than one feed at the same time. The Rack Gear is constructed to be withdrawn from the rack when the lead screw is in use. The inner bearing of the rack gear is carried close to the rack, and besides being in an inner plate securely fastened to the apron, is independently bolted to the carriage directly above its point of engagement with the rack. The range of screw pitches is from 2" pitch to 3½" pitch, and the feed is from 1" pitch to 64" pitch.

The bed is of the box form, carrying the guiding ways on the top and is open at the bottom sufficiently to allow the chips to drop through. It is much deeper than has heretofore been the practice, and the sides are tied by deep wide box braces, making it very rigid against deflection.

The features of the design of these lathes, are the absence of curved outlines and braces; straight lines being used wherever possible and sufficient metal has been used to gain great rigidity without clumsiness.

Drops from the Editor's Pen.

The out-of-date man is twin brother to the lazy man.

He who imitates is usually lacking in brains sufficient to initiate.

A man without ambition, like an engine without steam, is stationary.

Market reports are guiding stars to merchants who watch them.

—*Canadian Hardware.*

About Flather Lathes.

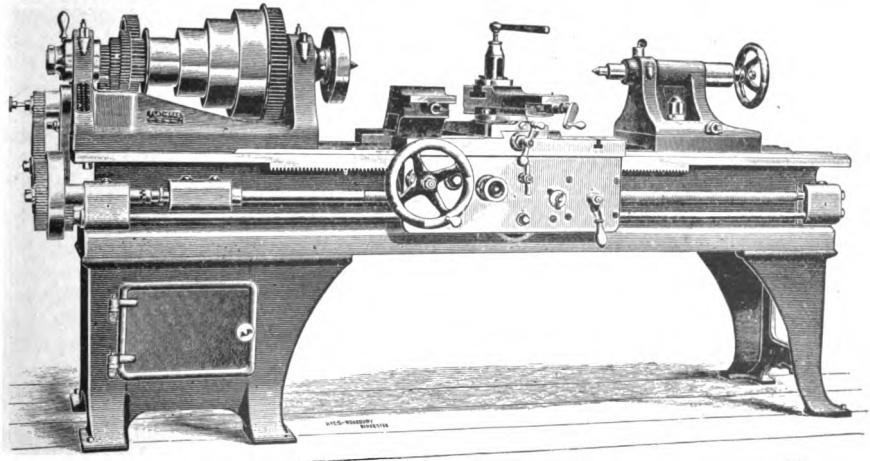
IN DESIGNING the Flather lathes, the aim has been to combine simplicity with efficiency. Every part has been carefully studied and tested for the work required, and ample strength is provided for all strains, no one part being made especially large to the detriment of the rest. Each part is made to coincide with the others and produce in their combination the highest degree of stiffness, strength, ease of manipulation and convenience of operation. The workmanship is up to the highest state of the art and is done in the most thorough manner it is possible for the best workmen to do. All machines are run, inspected and carefully tested by special gauges and appliances made for that purpose.

All lathes have hole through the entire length of the head spindle. The 15 " lathe has 1⅛ " hole; the 24 " lathe has 2⅛ " hole; other lathes in proportion. The patent feed is an excellent arrangement for producing readily a great range of feed, varying from ¼ " per revolution to 500 revolutions per inch. The new taper attachment has fully proven that it will turn a correct taper and has no back lash. All movements and adjustments can be made by the operator in the front of the lathe.

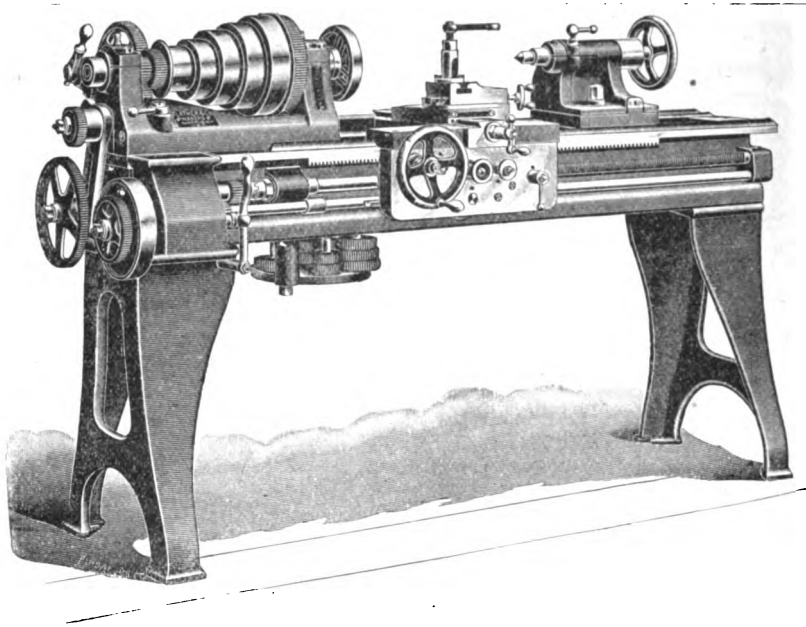
Among the special features are a new and effective stop, quickly and accurately adjusted; and a swinging table with studs to hold all the change gears out of the way of chips and dust, but quickly accessible for the selection of required gears. The rack pinion on all lathes can be instantly disconnected when the lathe is used for screw cutting, so that if the friction feed should be accidentally applied, no harm could result.

The first illustration shows the 1901 Model 14 " Engine Lathe, which has been designed to meet the latest requirements. The head and tailstocks are fitted to the bed with a V at the rear, and flat track in front, permitting the cross bridge of the carriage to be heavy and stiff. The spindle has a 1 " hole throughout, is made of the best crucible steel and is accurately ground. The centers are large, 1¼ " diameter and 5½ " long. The carriage is heavy and rigid, is gibbed inside and out and has large bearings on the V's.

The lathe is furnished with rod and



Flather & Co.'s 22 in. Lathe.



Flather & Co.'s New 1901 Model.

screw and has belt and gear feeds, which are driven by a combination of gears enclosed in a case, and by simply moving a lever, three changes of feed can be had with either belt or gearing. The racks and pinions are cut from steel, and all gears, studs and plat s in the apron are of steel. The lathe swings 15 " over bed and on a 6 foot bed will take 2 ' 10 " between centers. The cross slide screw is protected from chips and is provided with graduated collars. This lathe will cut from 4 to 72 threads per inch.

The Flather lathes are made in a large variety of sizes ranging from 14 " to 28 ", adapted for many purposes. The material used in all of them is of the best quality and carefully selected, and as the manufacturers have their own foundry, only such combinations of iron are used, that will produce strength, wearing quality, smoothness and finish.

The following letter, just received from Flather & Co., Nashua, N. H., gives in a concise form, some of their reasons for claims of superiority:

"We do not think there is enough attention paid by the buyers to the quality of material put into the machine tools or extreme carefulness in workmanship for same.

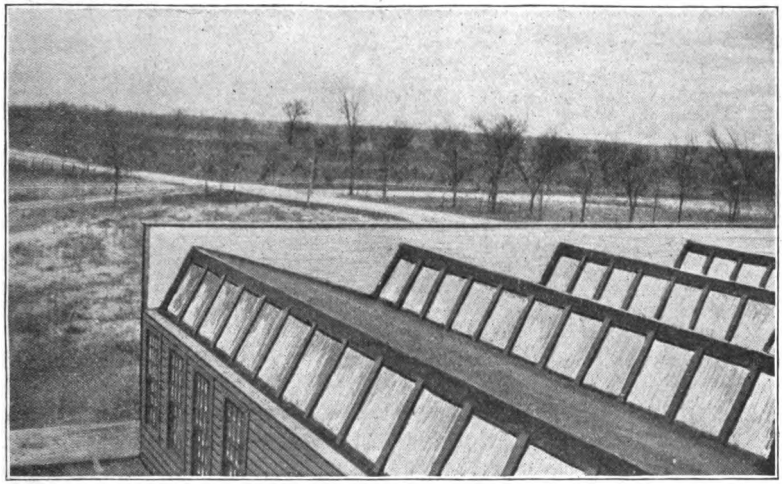
By using soft castings the parts can be machined, filed and scraped much quicker than can be done when the iron is selected for strength and close grain so as to finish well, and as hard as it is possible to work it.

It also makes quite a difference in a machine where babbitt metal is used, whether the GENUINE is used or something they call equally as good. When the tools are in your store you cannot see much difference as far as material is concerned, but when in actual use ONE machine will be about used up when the machine made of good material will be nearly as good as new. We have been very particular as to the Iron, Steel and other materials put into our lathes and they have always worn well. As a proof of this we would draw your attention to the fact that although we have made thousands of lathes, it is seldom you find one advertised for sale, while of some of the other makes, you will see them advertised in the machinery papers every week."

FLATHER & CO.

The New Home of the Milwaukee Miller.

THE new shop of Kearney & Trecker at West Allis, Milwaukee, where they now build the "Milwaukee" Milling Machine, is in many ways a model one. It is a large one-story building and is constructed with a saw tooth roof which provides it with an abundance of evenly distributed north light. Every part of the shop is perfectly lighted and as a result of both this and the management, there is a conspicious absence of dirt and litter of all kinds, which so often accumulates in dark corners.



The Saw Tooth Roof.

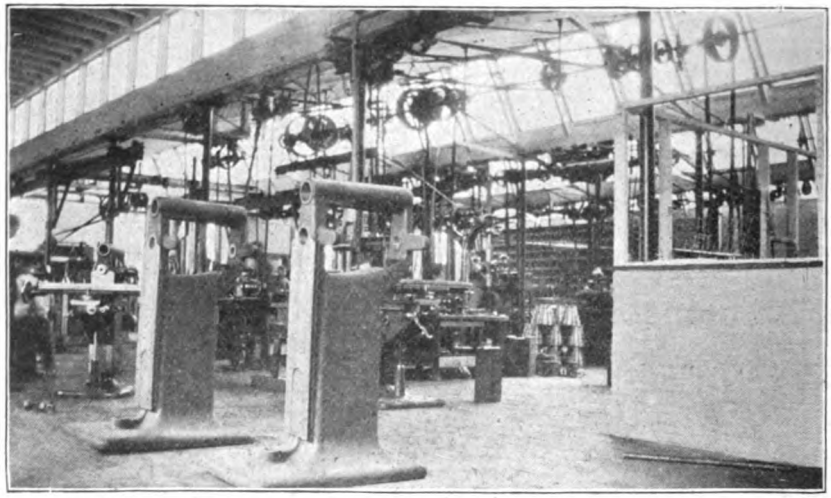
In addition to the machine shop proper, there are separate departments for the offices, pattern shop, pattern storage, paint shop, stock room and engine and boiler room All shafting throughout is hung from the roof trusses and all line shafts have friction clutches so that any section may be disconnected when so desired to make repairs or changes, or for any other cause.

The tool room is arranged with racks and shelves and is separated from the shop by wire netting. A tool room boy is in constant attendance and the check system is employed in giving out tools. The concern manufacture a large quantity of their own tools and have devised many short cuts and methods particularly adapted to the construction of their machines. The stock room is divided into two sections, one for rough stock, steel, etc., and the other arranged with racks for finished parts ready for assembling, The pattern shop storage room is furnished with numbered racks for the various patterns after the approved method. The paint shop is entirely enclosed so that no dust nor dirt may be allowed to spoil the finish of the machines. The offices and drafting room are located in one corner of the building and are very convenient in their appointments. Artificial illumination is provided by incandescent arc lamps and incandescent drop lights for each machine. Current is generated by a dynamo in the engine room. Independent water supply is also obtained from their own well, over which a large tank is erected on a tower.

A complete system of heating and ventilating by the hot air system is installed in the shop, the air being heated by passing over sets of steam coils and distributed by a large blower and sets of galvanized iron flues. The same air is used continuously, fresh air being taken in from the outside to make up for what escapes through windows, doors, and other channels.

It is interesting to note that four Kearney & Trecker millers are regularly doing duty finishing parts for new machines of their own class. One of them is the first milling machine the concern ever built and has been running continuously ever since its completion.

The firm of Kearney & Trecker form the ideal combination for the manufacture of machine tools, Mr. Kearney being very proficient in machine design and Mr. Trecker being an expert machine operator and well posted on economical methods of manufacture This does not imply, however, that each are not well up in both branches, but merely shows how the management and work are distributed. Anyone visiting the shop will not fail to be interested and pleasantly impressed by its order, neatness and the general atmosphere of good will which seems to pervade the works.



In The Shops.

Steel Secrets That Are Lost.

WHETHER India learnt her building arts from Egypt, or Egypt hers from India, is not yet ascertained, says a London newspaper. But, whichever it was, Egypt excels in the art. The imperishable mortar they had, of course. They performed feats of engineering which we could not accomplish at the present time—for example, the building of the pyramids—and they could carve hieroglyphics upon granite which can nowadays only be touched by jewels. But steel has been made which would probably carve this granite. Japan had this secret once, but has lost it now. But a drill was on exhibit some time back, made from this Japanese steel, which went easily through a standard file and was not dulled in the process.—*Canadian Hardware.*

Case-Hardening Coloring and Annealing with Granulated Raw Bone.

TO CASE-HARDEN WITHOUT COLORS

PACK the work to be hardened in a cast-iron box. The box should be of suitable size for the work—for screws ¼ to ¾ inches, or work of similar size, use a box about 4 inches deep, 4 inches wide and 8 inches long. Put a layer of Granulated or Pameacha Raw Bone in the bottom, then a layer of work to be hardened, and so on until the box is full within 1½ inches of the top. This space may be filled with old Bone that has been used. Put on the cover and lute with clay. In packing, be sure and keep the work at least ½ inch from the sides and ends of the box. Heat to a good cherry red from three to four hours, according to the depth of hardening desired. Dump the whole contents in clear, cool, soft water. Delicate pieces should be dumped in oil. For larger work use larger box and keep in longer.

In order to obtain the best results it is necessary to employ a furnace that gives and maintains a good uniform heat.

TO HARDEN RODS OR ROLLS, LEAVING TENONS SOFT FOR RIVETING

Finish the pieces to the required diameter, leaving a little extra length for trimming, but do not turn the tenons on the end or ends. Pack and heat the pieces, but do not dump. Allow the work to remain in the boxes until all heat has passed off. On being taken from the boxes the pieces are thoroughly annealed with the outer surface carbonized to a greater or less depth according to the time they were in the furnace. After turning the tenon, heat the piece to a cherry and plunge into cold water the same as to harden tool steel On removing from the bath the work will be found to be extremely hard wherever the outer surface has not been removed since carbonizing, but wherever this surface has been removed, as in turning the tenon, the softness of the original stock has been preserved. If the stock is required in rods for tenon, screw or similar machines cut in pieces as long as your furnace and pots will take, carbonize and anneal as described above. The finished work from these rods upon coming from the machines s ready to harden, leaving such portions soft as have been turned or cut after carbonizing.

The principle of this method is that only the carbonized portions will harden when heated and chilled and as the carbon enters but a short distance the carbonized surface may readily be removed, thus leaving the original stock, which will not harden, exposed to the action of fire and water. The principle may be adapted to a great variety of uses where hardness and softness are required on the same piece.

When it is not practical to remove any of the stock in order to remove the carbonized surface, the parts desired soft may be protected by covering them with a coating of fire-clay, thus preventing the carbonizing of the stock at these particular points with the result that when plunged in the cold bath they will remain soft.

To produce colors the Granulated Raw Bone must be thoroughly charred. This can be easily and cheaply done by putting it into iron boxes about 9x9x36 inches, covering tightly and placing it in the furnace at night, after the work has been withdrawn. The remnant of fire and heat of the retort is sufficient to char the bone during the night. If, however, there is much fire left, it must be partially deadened, as the object is simply to char the bone without burning it. If smaller boxes are used, they must be watched and taken out when bone is charred. If

there is sufficient oven room this can be arranged so as to be done during the day.

While good colors can be obtained in rather hard water, yet soft water will give much better results. The bath should be arranged as follows: Bring your water pipe up through the bottom of the barrel reaching about half way to the top; make the outlet about six inches from the bottom of the barrel; into your supply pipe connect a pipe from an air pump so that the air and water mix in the pipe and come into the barrel together. When dumping, have a running stream of water and air flowing into the barrel. Hang a sieve under the surface of the water in which to dump the work. While the air pump is not absolutely necessary, yet its use gives more satisfactory results. Running water is necessary if large lots are to be dumped, as the water must be kept cold. Small lots may be dumped into a bath of still water.

FOR ANNEALING WITH THE RAW BONE.

Pack the work to be annealed about the same as for case-hardening, but it is not necessary to keep the pieces separate, using the bone that has been burned a number of times until it is almost white. Place in the oven and heat until it is heated through to a cherry red. As soon as the work has reached the required heat, stop the blast and if the oven is not required for further work let the boxes remain in the furnace and cool down with the fire. Upon removing the boxes from the oven, cover them with warm ashes, old burned bone or air-slacked lime, so as to retain the heat as long as possible. Do not remove the work from the boxes until all heat has passed off. The more gradual the cooling the better the results.

[Courtesy of the Rogers & Hubbard Co., Middletown, Conn.]

The Evolution of Machinery.

IT cannot be said of any kind of machinery or machine tool that it has reached the point where improvement is impossible. New machinery and better tools are being constantly added to manufacturers' lists. They come and go with increasing persistence, and what is a time and labor-saver to-day is being supplimented or supplanted without any regard to dates. Inventive genius knows no halt, and is in unbroken movement round the orbit of industrial life. It cannot be boycotted, strangled, starved, or sun-dried. In speed, accuracy of work and simplicity of construction we have the ideal of inventive ambition. It is only by retrospect that we see the wide difference between the old and the new. No industry has been exempt from change or the spirit of progress that is brooding over everything. It presides at the loom and the forge, and in mine and mill. In cutting lumber and fashioning iron, in stamping dies and making spoons, and from the building of a bridge to the manufacture of a pill box, the use of improved machinery and tools is everywhere visible. The machinery industry is becoming one of the great potentials of trade, and in the exchange of the old for the new, we have a business that is rounding out to large proportions.

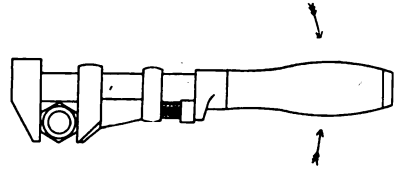
The manufacturer behind the times in the use of improved machinery travels a rocky road, not to fortune, but insolvency. Machinery is rapidly displacing hand labor and it will go on doing so till the last spindle hums, and the last wheel turns in the industrial world.

It would be well to remember in this connection, that as the man who handles a machine is the first to detect its shortcomings, in many cases he ought to be the best able to suggest improvements. What is wanted is more encouragement in this direction. Many machine users hold their peace in this matter, for the suspicion or knowledge they have that others would monopolize the benefits, some of which at least he would be justly entitled to. A more generous appreciation of practical suggestions would bring its own reward. In some instances this obligation is being recognized and with good results. It would be well for all concerned if this practice was more common than it is.—*Age of Steel.*

How to Use a Monkey Wrench.

November "Shop Talk:" Did you ever stop to think whether or not you knew how a monkey wrench should be used? If you haven't so far, do so now. Which way will canse the least wear and tear on the wrench and reduce to the minimum the possibility of slipping on the nut (incidentally spoiling the sharp corners and skinning your fingers.)

In the accompanying illustration would you push down on the handle or pull up,



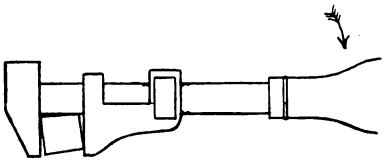
and why? We would like to hear from our readers about this.

More Answers:

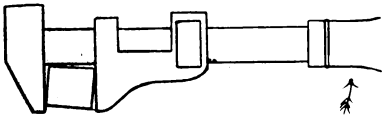
W. S. FRAZIER & Co.

AURORA, ILL., Dec. 26th, 1901.

In perusing the answers to the monkey wrench problem I find one correspondent wants to pull up on the handle because the greater strain is thus thrown on jaw A, which, by reason of its shape, is better able to stand it, while another likewise pulls up because the strain is thus sustained by jaw B which, being forged solid with the shaft, is the stronger.



The difference in leverage suggested is better shown by substituting for the hex. nut a square one. If we agree with Mr. Bay that the movable jaw is of the stronger form, – which perhaps is a reasonable contention,—then the pull should be downward for the general good of the wrench, —if a light one,—the relative amount of strain on the jaws being indicated by their points of contact with the nut.



I think, however, the handle should be pressed in the same direction as that traversed in placing the wrench on the nut, because the tendency of movement in the opposite direction is to pull it off. This recalls the principle of the spanner, which will operate only when pulled against the work, and I think furnishes the reason why most of us prefer to pull down,—a fear of skinned fingers incidentally, perhaps, having something to do with it.

E. S. FRAZIER.

BALTIMORE, Dec. 27th, 1901.

Having read the opinions of four practical men in reply to your query as to the proper way of pulling the monkey wrench as shown in your issue of SHOP TALK, I would thank you to give me your opinion. My experience of using monkey wrenches is very limited, therefore, I am not in a position to know which is the right way when I have the opinions of four practical men, each giving strong assertions why he thinks his answer is correct.

Hoping to hear from you at your earliest convenience, and thanking you in advance for your reply, I am,

ALLYN A. GARDNER.

[Like Mr. Gardner, we "want to know." EDITOR.]

MILWAUKEE, WIS., Dec. 29th, 1901.

Regarding that monkey wrench controversy I must say that I will have to line up with the pull down partisans by all means. I had that hammered into me pretty thoroughly when an apprentice, and from practical experience I agree with Messrs. Cosine and Roach. And they are right about the finger skinning business

also. I have a 12-inch monkey wrench at the present time that I have had for at least 10 years and it saw pretty hard usage for several years. It is a good as new and looks it, too, and all because I tried to handle it properly and never pulled up or used it for a hammer, and in my opinion the last is not as bad as the first.

I believe that 99 out of every 100 good machinists pull down on the wrench as shown. I am, however, open to conviction and if I am wrong I will admit it. In pulling down on the wrench you are pulling the wrench onto the work and keeping it there with no effort, while in pulling up you are not only pulling the wrench off from the work, but in doing so cause it to slip repeatedly and spoil both jaws of the wrench, take more time, cannot set up a nut as tight, and cuss more over it. Take a pipe three feet long and put over the handle of the wrench so as to give more leverage. Try it on something solid and I think you will find that in pulling up you will bend the back of the wrench and put it out of commission, while if you pull down you will not injure the wrench a particle, and whatever you are pulling will probably move.

E. D. GARFIELD.

ATLANTA, GA.,

The writer believes there would be few practical men of long experience to advocate pulling *up* on handle of monkey wrench as per cuts given in November and December numbers. He thinks, too, that the difference in strength between the stationary and movable jaw plays very little part in the question, and the direction of power applied on the handle immaterial so far as the jaws are concerned; but in pulling down on the handle or lever, the lever is thoroughly braced by the movable jaw and adjusting screw, and should there be any spring in the lever it tends to make the jaws of the wrench hug the nut closer, while the opposite is the case from power applied to the handle or lever n the opposite or "up" direction, the lever is not stiffened or braced by anything and any spring in the lever tends to open the jaws of the wrench causing it to slip on the nut. I have written to the Coes Wrench Co., who have produced a most excellent monkey wrench and no doubt have given deep study to every strain on one, for an expression on the subject; should they favor me with a reply I will give you the benefit of it with pleasure.

JOS. S. COOK.

LORING COES & CO.

WORCESTER, MASS.,

We have received two numbers of SHOP TALK for November and December for which you have marked the article, "How to Use a Monkey Wrench," and we are of the idea that you wish us to answer somewhat in detail.

Supposing the handle to be in the position of the cut shown, it should be always used as your correspondent says, with the power applied to the handle in the direction of the upper arrow. We regret that you have not gone more fully into the faults and abuses of the old wrench.

In our new wrench which we expect to market soon, we have wholly eliminated the weak features and have added new ones which you will appreciate when you see the model or a new wrench. In detail: we have placed the line of the thrust from the jaw to bolster lug further from the bar, thus making the support of the moving jaw much greater. The fault of the old wrench which this move does away with, is that the hold on a hex. nut is insecure, owing to the pressure being applied *behind* the center line of the bolt. The moving of the line of support outward from the bar will in a great measure obviate this, providing the nut is not too large for the wrench. This is a point, too, which should be considered. With the old square nut, there was little danger of turning off corners, but with the hex. nut, a wrench can be used to better advantage if it is not more than half opened, or in other words, use a size larger wrench

for a hex. nut than for a square one of the same diameter.

We have also done away with the groove in the face of the bar, which has heretofore held the head of the screw.

This makes the bar stronger and removes a cause of sticking from dirt wedging behind the head.

We have patents which gives the handle frame about 50% stronger than any cast handle heretofore made, and making it almost impossible to cripple the *handle* by using a pipe extension.

We also add new finishes, shapes and other details. We expect our new wrench to stand 30% more applied strain in any direction than any other wrench made.

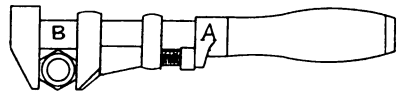
LORING COES & CO., Inc.

THE BILLINGS & SPENCER CO.

HARTFORD, CONN.

Replying to your favor of the 3rd, in reference to the article, "How to use a Monkey Wrench," in "SHOP TALK" of December, 1901, would say that the proper way to use the wrench is to "Push Down," and the way to ruin the usefulness of the wrench in the shortest possible time is to "Pull Up."

Our reasons for the above statement are that (referring to the enclosed sketch)



the reliability of the wrench depends wholly upon the part "A" being firmly and securely held in its proper place. In the ordinary monkey wrench the most essential feature is the ability of the bar "B" to withstand a bending strain. If you "push down" the bar is re-inforced by the sliding jaw and the adjusting screw, which are fundamentally held in place and supported by the part "A." If you "pull up" there is no support to the bar, and if the bar is bent, the part "A" is drawn away from its support of the adjusting screw and consequently the jaw slips away from its work, the utility of the wrench being thereby destroyed.

F. C. Billings, Supt.

(See December SHOP TALK for other opinions.—Editor.)

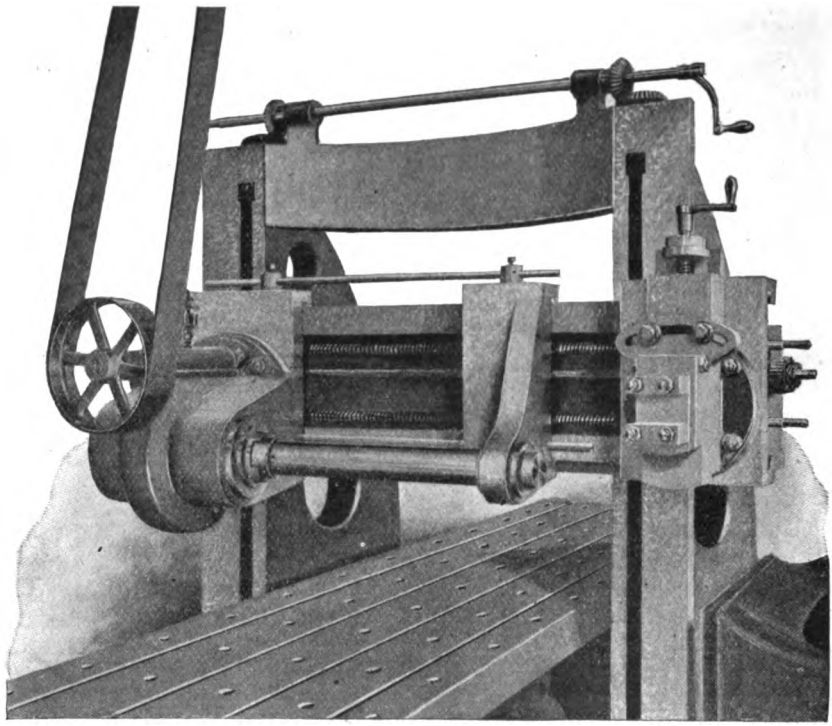
A Planer-Miller.

THE Farwell Milling Machine shown on page 16 is designed to be used in combination with planer and meets the demand for a machine tool of wide range.

When a casting is set ready for work, the more surfaces that can be finished without removing it, the better, especially when much time has been taken in setting it. This combination can be adapted to a large variety of work. Be ides plain, vertical and horizontal milling, the spindle may be driven in an angular position. By using a boring bar, horizontal boring can be accomplished. Vertical boring is also done with the machine by using a traversing head. It will be seen that by this arrangement, planing, milling and boring can be done on a casting at one setting and much time saved and greater accuracy secured. For instance: A large flat casting can be planed or milled off and several circular T slots or holes bored out at one setting.

The Milling Head is swiveled to the saddle which allows it to be used in any position, vertical, horizontal or angular. The Table Feed Mechanism allows the operator to change the planer table from planing to milling speed and vice versa, instantly. The saddle and bracket are made special and as the machine is built in three sizes it can be attached to any planer. Accompanying cut shows a No. 2 Machine, vertical spindle at work.

Catalogue will be sent on request.



The Farwell Miller on Planer. (Page 15)

Eight-Spindle Multiple Drill.

THIS machine not only saves time by drilling a number of holes at once, but saves a great deal of time in not having to move the work from one hole to another. It also saves all the time of clamping the work to the table, necessary with a single spindle drill, but not necessary with a multiple, as one drill balances another. (See cut page 17)

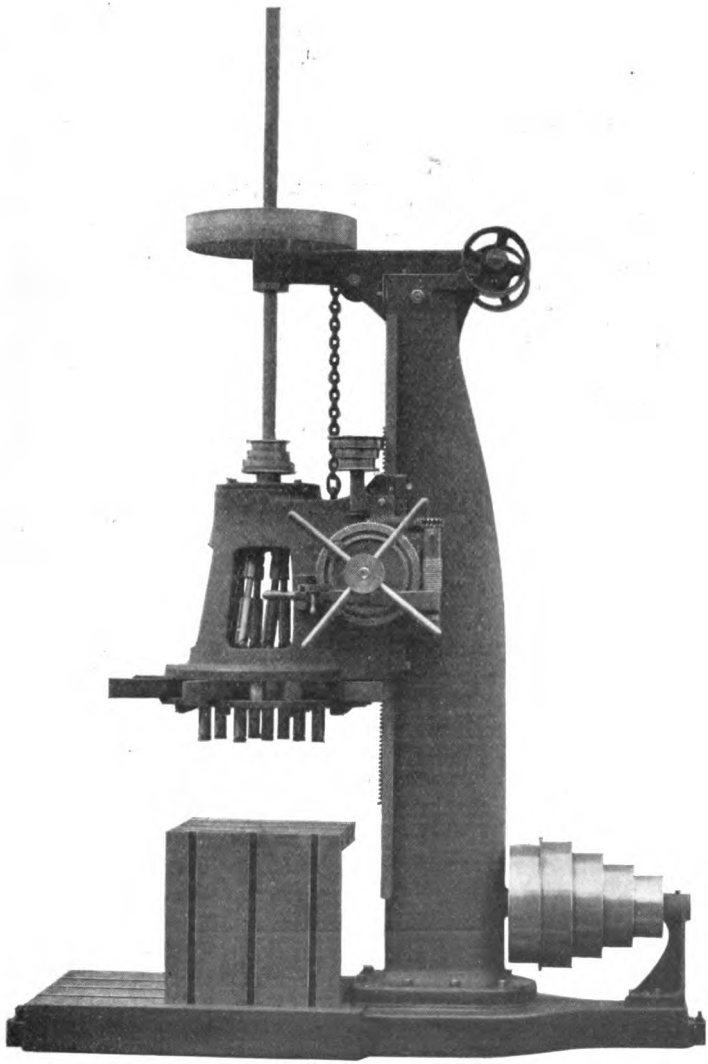
Spindles are adjustable in the head, and are instantly clamped by tightening one nut; each is fitted with ball-thrust bearings and hardened steel collars.

Vertical adjustment is provided independently for each drill, so that all can be made to strike the work alike. The head has an automatic feed, with quick return, and is balanced by a counterweight inside the column.

This machine can be furnished with 6, 8, 10 or 12 spindles, and arranged to drill holes very close together to suit special requirements.

The drills are heavily double back-geared inside the head, making them of ample power for the severest classes of work. The machine is of a heavy pattern throughout, designed for heavy work, and will be found particularly useful for drilling holes in steam engine cylinders, steam chests, and flanges of valves, fittings, etc. The gearing is all of steel.

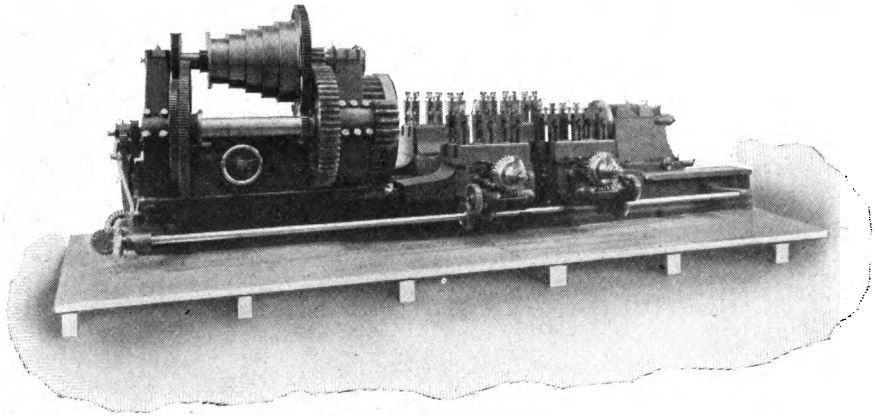
A reversing counter shaft can be provided at a slight additional cost, by means of which a number of holes can be tapped at one time.



8 Spindle Sensitive Drill. See Page 16.

A Huge Slicing Lathe.

SOMETHING new in the way of a lathe, designed and built by Israel H. Johnson & Co., of Philadelphia, is shown in this illustration. It is called a Slicing Lathe, and is intended for cutting up steel ingots into slices for making car wheels. The machine is most powerfully built throughout, as may be seen by the quadruple back gearing and massive proportions.



That famous Slicing Lathe.

On account of the weight of the work to be revolved, and the great strain upon it in cutting, entire dependence is not placed on the centers to hold the heavy ingot, but it is attached to face plates at both head and tail stocks, and the tail spindle is constructed to revolve in bearings, with the work. There are two carriages, each carrying six cutting-off tools, three in front and three behind, which are fed in simultaneously. The capacity of the lathe is 52 " swing and it weighs, complete, 100,000 pounds.

By this method of cutting up long ingots into stock for steel car wheels there is much less waste of material from the end of the ingot than where each piece is cast separately.

The Johnson Co. are well known for all their sizes and styles of lathes, particularly those of the larger swings intended for extra heavy duty such as forge work, heavy engine work, etc. They build nothing but lathes, and have always maintained the high standard of material and workmanship, which has gained them such an enviable reputation in that field

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Cutting Steel by Means of the X-Rays.

AN extraordinary method of cutting steel is that of Prof. Merkel, of St. Louis, Mo. The inventor, by taking a bar of steel, covering it with lead, leaving a narrow opening and exposing it to the X-rays, takes the temper out that particular space. On the softened spot he puts some fresh blood (to be renewed from time to time) and lets a weak electric current pass through the same In about 24 hours the plasmodia will have decomposed about three to five-sixteenth of an inch of the iron. It only takes a few weeks to bore cannons after this methods.

—*Electricity.*

EDITORIAL SHOP TALK

WITH this number "SHOP TALK" is firmly footed on a subscription basis.

It is an entirely separate part of of our business.

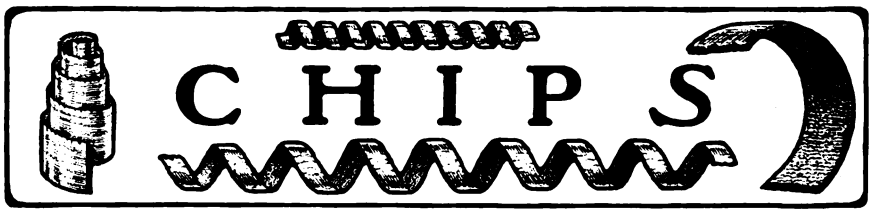
Although published at our private expense, we permit other houses to share our advertising columns.

And, while considerable space will be devoted to articles descriptive of the many splendid machine tools carried by us, these articles will be at the same time, of real value and of considerable importance through their instructiveness.

Much original matter will be published. Manuscripts submitted to the editor will be carefully read and, if available within the scope and limitations of this journal, be liberally paid for on acceptance. Simple things like the "Monkey Wrench Problem" (too simple for the more pretentious technical journals) are desired—yet abstruse technical theses free from the "dry-as-dust" charge are wanted equally.

We trust that our new typographical dress will please our readers.

At fifty cents a year "SHOP TALK" should be universally considered the cheapest proposition in the field of mechanical literature.



THE Draper triple back geared lathe can take a mighty big chip. If you don't believe it we can show you a photograph, or better still, a chip.

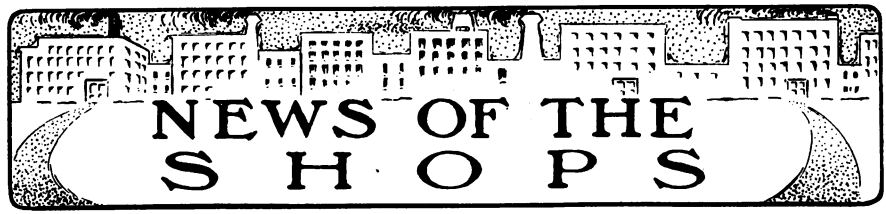
SUCH big chips don't come off a Flather lathe, but oh my, how long they will keep coming after you once put a lathe in your shop.

WHEN drill chips begin to come up small and fine around your drill, it's time to visit the drill grinder. The job will be done sooner and better.

HAVE you seen the chips from a Fellows Gear Shaper? They're wedge shaped, the thin end of the wedge forming the finished portion. They are *cut* off not pushed, owing to the top rake of the cutter. That's one reason the job looks so well when done.

OUR Oliver Wood Trimmers are the pattern makers delight. They slice a thin clean chip in any direction from his block, leaving a better and truer surface than a plane can give.

Read "Shop Talk" for shop talk.



DETAILS of the pension system for the 30,000 employes of the American Steel and Wire Company were made public a short time ago by officials of the concern. There is one unique feature in the plan. All employes who are put on the pension list agree that they will be ready at any time to answer a call from the officials of the company and give advice regarding the workings of the department they were once connected with. The system will be maintained by the income of a fund which has been set aside by the company. The distribution will be in charge of a committee and board of arbitration. Any man disabled, though only on the pay rolls one day, will be cared for. There will be retirements for age also.

Plans have recently been completed for an addition to the present shop of the Berlin Machine Works at Beloit, Wisconsin. The new building is to be 200 feet square, and will be used as a machine shop. It is to be one story high and will have a saw tooth roof. Several new features will be introduced into the roof, such as elevating one half of it sufficiently to accommodate a 25 ton traveling crane. Space will be provided for loading directly on cars at one corner of the shop, by omitting the columns and spanning the distance with an extra truss. Shafting will be hung directly from the roof trusses. Nimmons & Fellows, of Chicago, are the architects.

After a long conference the Sheet Metal Manufacturers' Association and the Sheet Metal Workers' Union in Chicago have reached an agreement, and the long war between them is at an end. The workmen are conceded 42½ cents an hour. Contractors cannot employ nonunion men except when the union cannot supply members of the organization. Car fare in excess of going to and from home and the shop where employed will be paid by employers. The union will withdraw from the Building Trades' Council. All strikes are declared off.

J. Thompson & Sons, of Beloit, Wis, expect to move to their new and modern shop at South Beloit, Ill., some time this month. They will only move the foundry and machine shop at present and will build the Lewis gas engine in their new quarters, retaining their implement manufacture in the old shop till next summer. Power will be supplied by several large size gas engines until the complete transition from the old shop is made.

The American Locomotive Company recently turned out from the Schenectady plant the largest locomotive ever built. It is of the decapod type and weighs 275,000 pounds. It has ten driving wheels and will be used on the freight service in the mountain districts on the Atchison, Topeka and Santa Fe road.

The McCormick Reaper Works, Chicago, have commenced to equip some of their machine tools with electric drive, and though the change will be gradual, they expect, after a time, to have most of

those tools in the machine shops which are adapted to that form of drive, fitted with electric motors.

Ingenuity Versus Laziness.

A WRITER in an English engineering magazine recently made the statement that American workmen were the laziest people he had ever seen, referring particularly to machinists and those employed in like trades. On first reading, such a criticism seems unjust and harsh, but a complete study of the article referred to shows that it was meant in a kindly sense, and was in reality a criticism of the English workmen for whom the article was intended, hence it must be received in the spirit in which it was given, as a compliment to the American workman. The writer stated that an American workman, instead of going blindly and unthinkingly about his work, was constantly scheming to get some device which would do the work for him, so that he might sit down and think and scheme about what he was doing, while the device or contrivance attended to the actual mechanical manipulation.

Yankee ingenuity is proverbial, says *Mines and Minerals*, and whether we ascribe as the incentive of this ingenuity laziness an the part of the Yankee, which leads him to devise schemes and apparatus which will do his work for him, or a fertile imagination and keen powers of perception, the result is the same, viz., an extremely ingenious and thoughtful body of workmen, who are second to none in originality and in constructive skill. We do not mean that they monopolize these facilities, but the intensity and freedom of American life seem to peculiarly develop a man along these lines, and much more strikingly than is the case abroad, where he is decidedly hampered by precedent and class distinction.

A recent American writer upon industrial subjects stated that he had a contempt for the man who made a mule of himself in the accomplishment of heavy labor and did not try to devise some method to relieve himself of the burden of doing things by mere brute force.—*Modern Machinery*.

NEWS of THE MONTH

CONTRACTS for the third greatest cantilever bridge in the world, which is to form the Wabash's span of the Ohio River, have just been placed in Pittsburg. The American Bridge company has been awarded the contract for the bridge superstructure of steel. The great bridge across the Ohio River will cost for erection nearly as much as the structure across the Monongahela River in Pittsburg—about $1,000,000. The American Bridge company will erect the steel superstructure of both. The length of the Ohio River bridge over all will be greater than that of the Monongahela River bridge. The Ohio bridge will have three spans besides the cantilever, which will be a clear span of 650 feet, not being as great as the cantilever of the Monongahela structure. The Ohio bridge will stand, however, as the second greatest cantilever structure in America, these two steel waterway spans of the Wabash road being only overshadowed by the famous Firth of Forth bridge in Scotland.

The Submarine Signal Company, of Boston, finds that the blows on their submarine bell, striking in the upper harbor, cause vibrations in every vessel in port. An experiment was made to learn if the sound from a bell could travel from one side of the harbor to the other, pass all obstructions, and pierce the thick sides of an ocean liner so that the sound might be received in some part of the steamship. The company's barge, Sea Bell, with striking apparatus, was stationed at the New England docks and representatives of the company stationed themselves in the shaft tunnel of the Cunard steamship Ivernia. The signals not only pierced the Ivernia, but came so freely that even its direction was apparent.

The Krupp cannon foundry is preparing the greatest individual exhibit in the history of expositions for this year's Westphalian arts exhibition, which opens at Dusseldorf in May. This will be the first display arranged by the great cannon builder since the Chicago World's Fair. It will cost more than 5,000,000 marks ($1,190,000). The exhibit will be replete with types of monstrous war weapons, the chief of which will be the 30½-centimeter coast defense gun, built for the imperial fortification board. At one end of the Krupp pavilion will be the prow of a German battleship bristling with guns.

Guglielmo Marconi has announced that he has received wireless signals at St. John's, N. F., from his station on the Cornwall coast 1,740 miles distant. The signals consisted in the transmission of the letter "S" a number of times, according to the arrangement previously made with his electrician in the Poldhu station. Some people are inclined to be skeptical as regards the authenticity of this performance but Sig. Marconi asserts it to be a positive fact.

The commission appointed by the Supreme Court to consider the advisability of extending the New York rapid transit system by a tunnel from the City Hall to the Battery and thence under the East River to Brooklyn, regardless of the con-

sent of abutting property owners and in accordance with the plans of the Rapid Transit Commission, have reported in favor of the plan. The Commissioners are in favor of the two-track tunnel to the Battery, because a four-track tunnel would be too expensive for the city at present.

The Navy department has taken the initial steps toward the adoption of wireless telegraphy as a means of signaling between warships at sea. Rear Admiral Bradford of the bureau of equipment has asked that the armored cruisers of the Pennsylvania class have their masts and rigging so arranged that the wireless system can be introduced. It is intended to get test sets of instruments of the various wireless systems now being operated, including the Marconi system.

A Clever Tool Holder.

THE "O. K." Tool Holder possesses peculiar advantages, and advantages that make it especially useful when it is necessary to change tools often. All shapes of tools in common use are furnished with this holder instead of one special shape as is usually the case. Any of these tools can be removed from the holder and another substituted without disturbing the holder when once placed in position on the lathe or shaper. This change can be made instantaneously, making a time saving of no mean moment.

The holder is so constructed as to hold the tools as firmly as though they were a portion of the holder itself, and a quarter turn of the handle serves to release the tool and allow another to be inserted. These tools are drop-forged from the best quality of Jessop tool steel and are accurately ground for clearance. Any tool can be furnished promptly and at a price less than the cost of redressing and grinding an old style tool.

This holder is, as the name implies, just exactly right.

CRITICISM & REVIEW

The Practical Gas Engineer, by E. W. Longanecker, M. D., 106 pages, 4½ x 7. inches, cloth, $1.00. Published by the author Anderson, Ind.

Intended as an aid to the prospective purchaser of gas engines, the man who runs them, or anyone wishing to post himself on the management, care, operation and selection of a gas or gasoline engine The book deals with the construction, equipment and operation of the gas engine, gives the principal gas engine troubles which are ordinarily encountered, and their remedies, and general information as to starting, testing, etc. The subjects are handled with an entire absence of the theoretical, and practical questions treated from a practical point of view. It is a decidedly instructive book for anyone at all interested in gas or gasoline engines.

The Thompson Blue Book on Advertising, 6x9¼ in., 286 pages, cloth, published by J. Walter Thompson Co., New York.

An elaborately gotten up book on advertising in general and the Thompson Agency in particular, with lists of the leading daily, weekly and monthly publications of all classes, together with much information about each periodical. It is a useful book for advertisers.

The Christmas number of "*Dixie*" is unusually good. The industrial development of the South in the first year of the new century has indeed been wonderful — an advancement without a parallel in the history of this or any other section and of such magnitude as to make it difficult for even the combined efforts of all the industrial papers to keep the public fully informed. It is, therefore, not attempted in this issue of "*Dixie*" to completely cover all phases of the situation, but merely to supplement its work during the year by offering some reliable information concerning the developments that are attracting the greatest attention.

The December number of "*The Trade-mark Record*" is another specially good one. A dozen or more specially written articles tell of the year's progress at home and abroad, of various phases of patent and copyright law, of inventions, etc., make it a valuable number for reference.

A handy pamphlet on "How to obtain Patent, Caveat, Trade-mark and Copyright Protection, with Decisions in Leading Patent Cases," is published by E. G. Siggers, of Washington, D. C. The pamphlet contains, among other things, a map of Washington, and is replete with valuable information to inventors. A copy of it can be obtained free of charge by addressing E. G. Siggers, 918 F Street, N. W., Washington, D. C.

The holiday issue of *Farm Machinery*, contains a number of illustrations of Men of To-day and their Homes, which are very handsomely gotten up and a great credit to Eli.

Farm Implements' holiday number illustrates Minneapolis' new implement district and warehouses, and the officers of the National Association of Agricultural Implement and Vehicle Manufacturers. Advertisers seem to consider it a good medium.

The Age of Steel announces its 44th anniversary with a special number containing many interesting articles covering large field of subjects, all attractively illustrated.

In the first number of its new volume, *Modern Machinery* starts several series of articles of interest to machinists and machinery men in general. Several prominent engineers and manufacturers are also contributors.

The Implement Trade Journal devotes several pages of illustrations to the Jobbing Houses of Kansas City, and quite a space to Oklahoma, showing typical scenes in the land of homes.

Non-Explosivs Boilers.

A FEATURE of a new steam engine exhibited at the Glasgow exhibition is a "non-explosive" boiler, which is built upon a new principle. The essential point is the reduction of the water space to the smallest possible limit, and the retention of large reserve steam power by the use of copper slabs as heat reservoirs. The slabs are placed in the furnace and their outer surface exposed to the hot gases. The feed water, having been previously heated in a cooler part of the boiler, is forced by a pump into passage in the copper slabs, provided for the purpose, where it is instantly transformed into steam According to the inventor, should any sudden demand for steam arise, it is only necessary to force in more water, the heat stored in the copper slabs being sufficient to evaporate the required larger amount. —*Exchange.*

Sound Transmission via. Arc Lamp.

A MEMBER of the facualty of the Mascow Imperial Technical Schoo1 recently discovered, says a Russian paper, that a microphone, when attached to an electric arc lamp by wire, will transmit sounds through the medium of another electric arc lamp. Repeated experiments were made, in which the two lamps were separated by a thick wall. The inventor read in a low voice a lecture on his discovery, and his words, spoken into the microphone, were comfortably auditable in the next room. —*Exchange.*

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 8.—Chicago—Young man as city salesman for machine tools. Must be a hustler and have good references.
Hill, Clarke & Co., Chicago.

Application No. 24.—Superintendent of machine shop; applicant is personally known to this office and can be strongly recommended. Address Hill, Clarke & Co. (for G. B. C.), Chicago.

Application No. 25—Electrician—Young man, 19, with manual training and working experience, desires position as assistant electrician in Chicago or Milwaukee or vicinity; references. Address G. F. B., care Hill, Clarke & Co., Chicago.

Application No. 26—Mechanical draughtsman; graduate Manual Training School; holding position; prefers situation in or within 100 miles of New Haven, Conn. Address G. S. E., care Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of ten cents per line, a line averaging about fifteen words. Advertisements with replies to come in our care will be published free of all charges including corresponding with the interested parties.*

The Metric System.

CONSUL HAYNES, of Rouen, says that the metric system is to-day compulsory in twenty countries, representing more than 300,000,000 inhabitants—Germany, Austria-Hungary, Belgium, Spain, France, Greece, Italy, Netherlands, Portugal, Roumania, Servia, Norway, Sweden, Switzerland, Argentine Republic, Brazil, Chile, Mexico, Peru and Venezuela—and advises American exporters in dealing with any of these countries to adopt the system.

Small Advertisements will be published in this department at the rate of ten cents for each 15 words (or fraction thereof). If desired, answers may be addressed in care of Hill, Clarke & Co. without further cost.

FOR SALE—12 in. Pipe Machine—One Curtis & Curtis 12 in. Pipe Machine that will thread pipe from 2½ to 12 in. in diameter. It is not often that a machine of this class is on the market, second hand. Address Hill, Clarke & Co., Boston.

FOR SALE—One Johnson Engine Lathe, 30 in. swing, 24 in. bed, complete with compound rest; built by I. H. Johnson, Jr. & Co., Philadelphia. Owned by a customer who made a mistake in size—he needed a larger one. It is a standard lathe, just completed and ready for shipment. Address Hill, Clarke & Co., Boston.

FOR SALE—One second-hand 4-horse power Gasoline Engine, complete with pipe fittings etc.; in good condition, Price, f. o. b. Chicago $150.00. Bargain. Hill, Clarke & Co., Chicago

FOR SALE—One Pawling & Harnischfeger horizontal Double Post Drill, with 7 feet vertical movement; table 48x60 inches, 15 feet of track; good condition. Hill, Clarke & Co., Chicago.

FOR SALE—Clough Vertical Milling Machine with Slotting attachment. Table 20 in. long, 7 in wide; movement 12 in. lengthwise, 6 in. cross wise, 18 in. vertically; capacity up to ⅝ in. mill heavy cut, up to 1½ in. mill light cut; weight 800 lbs. Ordered by a customer whose work demanded heavier machine, and now offered at a bargain. In first-class condition. Hill, Clarke & Co., Chicago.

Scrap Pile.

IN a recent issue of the *Iron Trade Review*, a correspondent gives some drawing-room kinks that will be of general interest to shop men:

I got into a drafting-room recently and found what a friend of mine calls a left-handed job. It seems that a tracing had in some way gone astray - lost or destroyed beyond recovery—and there was nothing in sight but a blue print or two as souvenirs of the departed. A draftsman took one of the blue prints, stretched it out on the board, and followed the lines and lettering with drawing ink of the waterproof type. The blue print was then allowed to dry for a short time to make sure that there was no moisture about the work when the next process was taken up. This consisted in the preparation of a bath of soda and water. The print was immersed in the mixture and the black lines soon stood out prominent against the bleached background.

There is one instrument that the draftsman purchases with no great amount of pleasure because it is seldom needed on average work. I refer to the beam-compass. The drawing of large arcs and circles comes along once in a while and the borrowing of the necessary tool is not pleasant; on the other hand it looks like extravagance to invest so much money in something that is rarely used. An engineer, who occupies an enviable position in his profession, has occasion now and then for the use of a beam-compass. He has no elaborate outfit for the job; a slender wooden rod, two pieces of cork, and the needle and pencil legs borrowed from another pair of compasses. The cork pieces fit on the rod and needle and pencil legs pass through the corks at right angles to the rod. The elasticity of the cork has enough grip to cling closely to the parts and at the same time permit ready adjustment of the tool. The material, wood and cork, is at once cheap and light. Given the same amount of skill it is capable of doing just as good work as a much more expensive outfit.—*Dixie.*

The BARGAIN LIST

Some are new machines that we own cheap, or are special machines not required by every shop, and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

LIST OF SECOND-HAND TOOLS IN CHICAGO.

SECOND-HAND LATHES

One Perkins Lathe, 17"x8', Hollow Spindle, Power Cross Feed.
One Fitchburg Lathe. 15"x6'.
One Blaisdell Lathe, 13"x5'.
Two 19"x6' Eddy Lathes.
One 14" x 5' Engine Lathe.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One 2-Spindle Slate Sensitive Drill.
One 2-Spindle W. & R. Sensitive Drill.

SECOND-HAND SCREW MACHINES.

One No. 3 Pratt & Whitney Screw Machine without wire feed, friction back gear.
One No. 3 Pratt & Whitney Sorew Machine, plain head.
One ¼" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No. 2 Bardons & Oliver Turret Machine, plain head.

SECOND-HAND SPECIAL CAR BUILDERS MACHINES.

One Berry & Orton Tenoner.
One Berry & Orton Wall Saw.

SECOND-HAND SHAPERS.

One 12" Heavy Shaper.

SECOND-HAND PLANERS.

One 36"x36"x12' Wood & Light Planer.
One 30"x30"x8' Whitcomb Planer.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One Diamond Face and Hole Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One No. 2 Houston Mortiser.
One Medium size Mortiser.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Putnam Bevel Shear.
One No. 2½ Pratt & Whitney Cut-off Machine.

NEW AND FIRST-CLASS TOOLS IN CHICAGO

NEW BRAINARD AND OTHER MILLING MACHINES.

Write for Special Circular.

NEW TURRET LATHES.

One No. 4½ Bardons & Oliver Screw Machine, 2-step cone, wire feed.
One Bardons & Oliver No. 15 Brass Lathe, with friction back gears and set over turret.

NEW DRILLS

One Four-Spindle Fenn-Sadler Multiple Drill.
One Foote, Burt & Co.'s 3-spindle, Universal Adjustable Bench Sensitive Drill, automatic feed.
One 87" Baush Boring and Turning Mill.

NEW GRINDERS.

One Gorton Disc Grinder.

HILL, CLARKE & COMPANY,

Better-best machine tools.

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in the basement.
NEW YORK: at 253 Broadway.

On the BARGAIN COUNTER

An Extraordinary Sale of

CUTTERS

For Gear-Cutting and Milling Machines purchased at a loss from a concern that has gone out of business and now put

On sale at prices averaging 15 to 20 per cent. of their actual value.

There is nothing the matter with them in any way—all are of high grade steel, accurately cut and well hardened. We do not, however, guarantee these cutters, considering the low price at which we offer them.

INVOLUTE CUTTERS PRICE, EACH 25c

Pitch	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
2	1	0	0	0	0	0	0	0
2¼	2	2	2	1	1	2	2	1
2½	2	0	2	2	0	1	2	0
3	20	0	19	17	7	12	8	9
3½	5	1	0	3	1	0	0	3
4	9	0	0	5	8	3	2	8
5	12	0	0	0	9	1	4	7
6	6	2	0	0	0	0	0	4
7	13	10	9	11	16	18	20	37
8	0	0	0	0	0	0	0	23
9	4	2	6	0	8	7	4	12
10	17	22	21	7	19	14	17	12
12	0	0	0	0	0	0	0	4
13	10	3	10	11	12	9	9	11
14	9	4	9	10	3	7	9	12
15	11	6	8	16	11	11	12	14
16	8	0	0	0	0	0	10	11
17	17	18	10	16	17	17	17	14
18	24	13	20	22	23	27	31	37
20	1	2	2	7	15	19	12	21
22	19	32	34	34	29	26	36	39
24	0	0	5	2	1	17	18	12
26	17	17	21	21	36	26	24	29
28	15	20	21	21	18	21	20	21
30	3	9	6	6	8	6	16	5
32	15	9	8	7	22	18	19	15
36	11	12	11	6	14	12	13	17
40	14	3	17	11	12	9	10	9
48	0	7	8	7	7	8	7	2

S. L. Drill Cutters.

Price each 15c.

7	No. 1	1-16″
7	“ 2	1/8″
4	“ 3	3-16″
17	“ 4	1/4″
5	“ 5	5-16″
7	“ 6	3/8″
9	“ 7	7-16″
10	“ 8	1/2″
8	“ 9	9-16″
8	“ 10	5/8″
7	“ 11	11-16″
2	“ 13	13-16″
6	“ 16	1″
12	“ 17	1 1/8″
10	“ 18	1 1/4″

Twist Drill Cutters, 15 cents each

10	No. 1	1-16″
7	“ 3	3-16″
1	“ 4	1/4″
13	“ 5	5-16″
7	“ 6	3/8″
6	“ 7	7-16″
4	“ 8	1/2″
13	“ 9	9-16″
9	“ 10	5/8″
11	“ 11	11-16″
8	“ 12	3/4″
19	“ 13	13-16″
8	“ 14	7/8″
15	“ 15	15-16″
15	“ 16	1″
16	“ 17	1 1/8″

Tap and Reamer Cutters, 15 cents each.

2	No. 1	1/8 to 1/4″ Reamer 6th cutter
		1/8 tap 4th “
3	“ 5	11-16 to 7/8″ tap cutter,
1	“ 6	15-16 to 1 1/4″ tap cutter
4	“ 7	1 5-16 to 1 3/8″ tap cutter
9	“ 8	1 11-16 to 2″ tap cutter
6	“ 8	2″ tap cutter

Angular Cutters, 25 cents each.

2	70½	Angular Cutters,	L
5	80½	“ “	R
2	80½	“ “	L
2	50½	“ “	L

Spiral Face Cutters, 25 cents each.

1	1″	face,	3″	diameter
2	1″	“	4″	“
1	1″	“	3 11-16″	“
9	1 1/8″	“	3″	“
1	1 1/4″	“	3″	“
1	1 1/2″	“	2 5/8″	“

20 SPECIAL CUTTERS.

Straight Face Cutters, 50 cents each.

3	7-16″	face,	2½″	diameter
3	5/8″	“	“	“
7	11-16″	“	“	“
3	7/8″	“	“	“
1	15-16″	“	“	“
5	7-16″	“	3″	“
2	5/8″	“	3″	“
6	11-16″	“	3″	“
5	13-16″	“	3″	“
2	3/4″	“	3″	“
10	7/8″	“	3″	“
20	15-16″	“	3″	“
1	3/4″	“	2 15-16″	“
1	9-16″	“	4″	“
2	3/4″	“	4″	“
3	7/8″	“	4″	“
1	1″	“	4″	“
1	7-16″	“	4″	“
1	1/2″	“	4″	“
2	3/4″	“	5″	“

Hill, Clarke & Company,

Better-best machine tools.

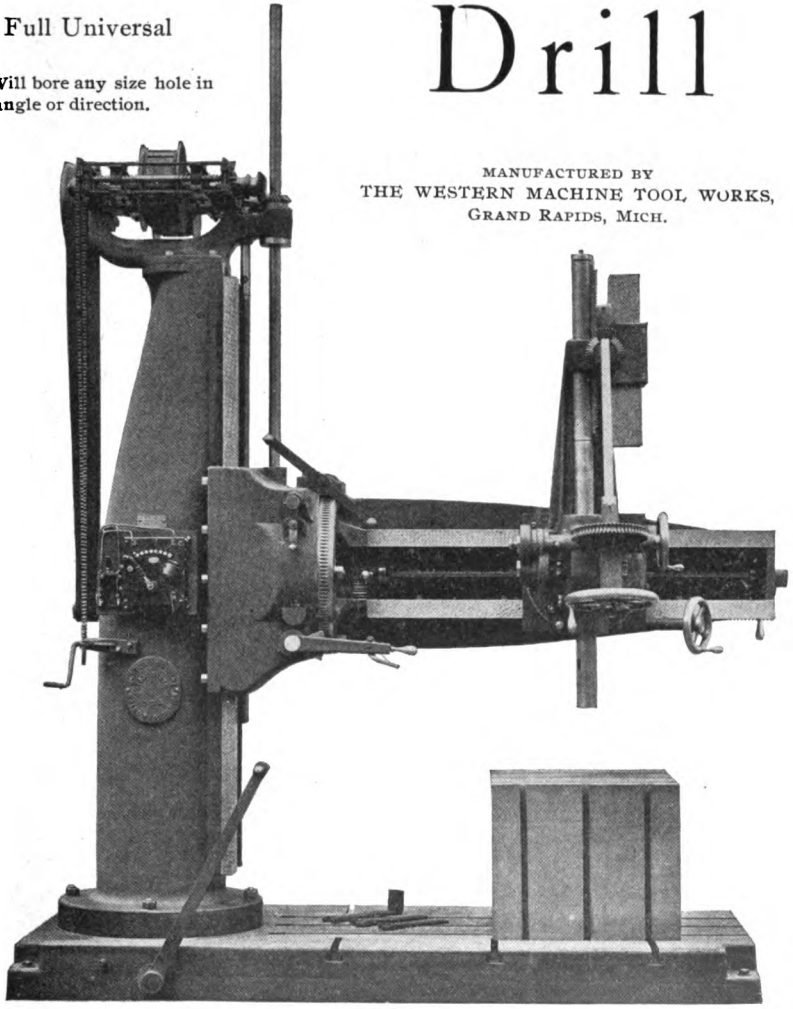
BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in the basement.
NEW YORK: at 253 Broadway.

"Western" Radial Drill

Full Universal

Will bore any size hole in any angle or direction.

MANUFACTURED BY
THE WESTERN MACHINE TOOL WORKS,
GRAND RAPIDS, MICH.



FRONT VIEW MOTOR DRIVE IN REAR.

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Better-best machine tools.

BOSTON: at 156 Oliver street.
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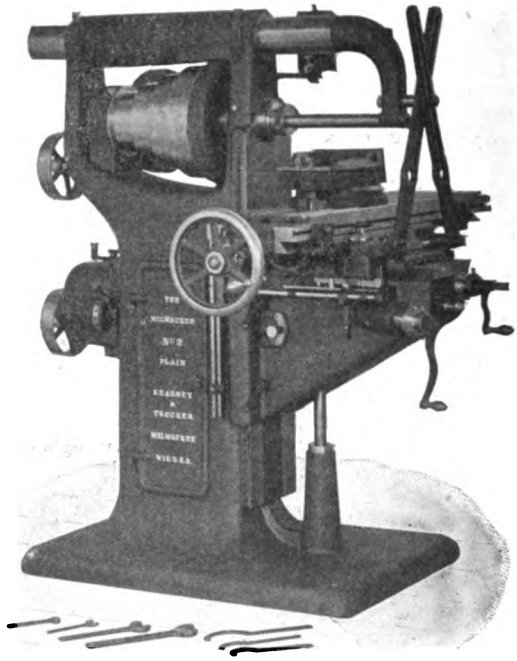
NEW YORK: at 253 Broadway.

Milwaukee Milling Machines

are ahead of others



This is the No. 2 Plain Milling Machine with all automatic feeds. We can specially recommend it for manufacturing purposes. It may also be fitted with vertical spindle attachment shown on page 2 of January "SHOP TALK."

Automatic Table Feed ..... 28''
Automatic Cross Feed of Carriage ..... 10''
Automatic Vertical Feed of Knee ..... 18''

Hill, Clarke & Company,

Better-best machine tools.

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in the basement.
NEW YORK: at 253 Broadway.

"Shop Talk"

THIRD NUMBER OF THE SECOND VOLUME.
MARCH, 1902.

Milling Machines and How to Use Them.

The first of a series of articles written expressly for SHOP TALK.

Chapter I—The Machine.

IT IS not the object of these papers to enter into any lengthy theoretical discussion, preferring rather to leave that part to those whose thoughts and pens run more to the purely speculative, while a few plain practical facts are here set forth, drawn, for the most part, from personal experience.

While the existence and use, under certain conditions, of the "Lincoln," "Slab" and "Rotary Planer" type of machines are recognized, reference here is made only to the "Knee Type," which, on account of its greater range, convenience and adaptability, has become more widely known, and consequently more thought has been put into its design and greater care and specialization into its manufacture.

Machine tools can lay no claim to great antiquity, and accuracy is a still more modern attainment. James Watt writes that in boring an 18-inch cylinder he found the largest diameter to be ⅜-inch greater than the smallest. The improvement in the steam engine necessarily had to be preceded by improvement in machine tools, and the great throng of machines brought into existence by the advent of steam has been obliged to constantly look forward to the latest thing in machine tools as regards power, accuracy and convenience, for their own improvement and development as well as for their rapid production.

The knee type milling machine is among the latest additions to the machine tool family, but it has taken its place in thousands of progressive shops, where it is used to the best advantage as far as the knowledge of the art has progressed at this date, although there yet remain many shops where its advantages are not understood, and work is being done on other machines, or by hand, when it could be done on a milling machine at a great saving in cost, if a little thought was given to the proper cutters and equipment.

The next chapter will contain some hints as to cutters. Let us first get a thorough understanding of the machine, its movements, how they are obtained and controlled, enabling us to more readily comprehend the method of doing different classes of work as explained and illustrated later.

The machine illustrated is the Milwaukee No. 2 Universal, and consists of a frame or column cast entirely in one piece with thick walls and strong internal ribs to give strength to resist heavy strains and maintain its original accuracy. The col-

umn has dovetailed ways to carry the knee and is extended higher than would otherwise be necessary, to give added stiffness, also affording means for carrying the Vertical Spindle, as illustrated in Fig. 2. The work table is, in reality, a compound slide having automatic vertical movement, as well as in and out and lengthwise. The swivel carriage has circular base to fit the saddle and is graduated in degrees, making it possible to swivel the table either to the right or to the left; four bolts securely clamp the two together at any angle without interfering with any of the automatic feeds; this feature is very desirable for the tool room and general work, and is indispensable for spiral cutting, such as spiral mills, reamers, or gears. This constitutes the main difference between Plain and Universal Machines, for in the Plain machine the saddle and swivel carriage are cast in one piece, giving, however, all the table movements of the Universal except the angular.

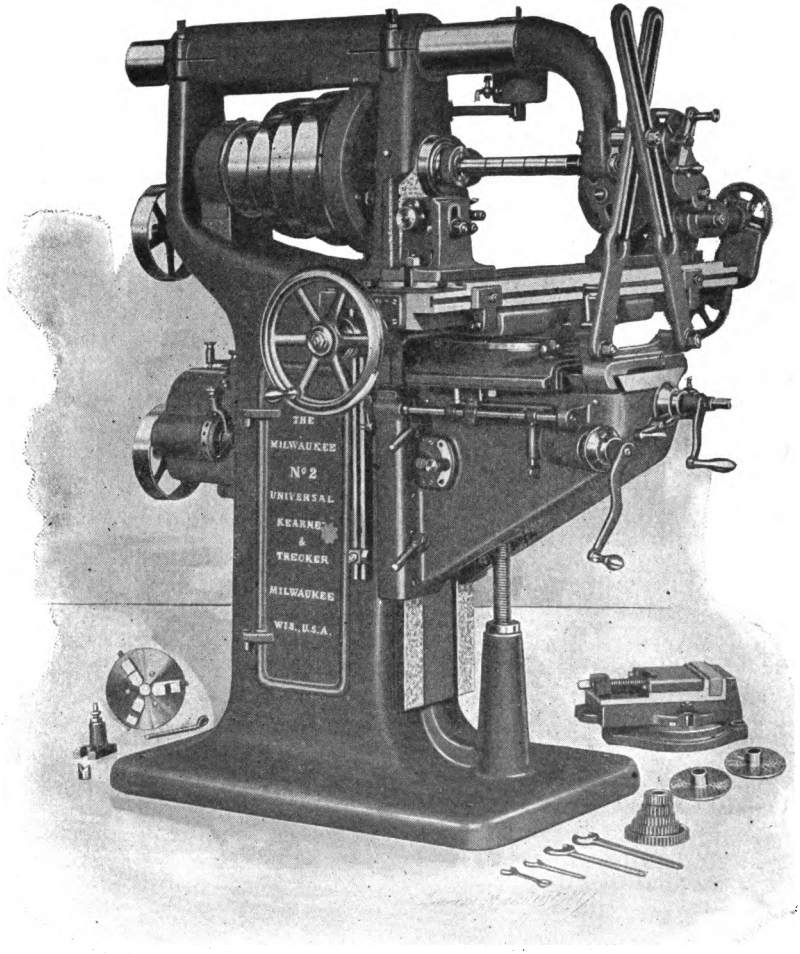


FIG. I. NO. 2 UNIVERSAL MILLING MACHINE.

The automatic feeds are so constructed that only one can be engaged at a time, a

very important feature. When the handle shown at the side of the knee is in a central position, the lengthwise table feed is engaged or reversed by the handle on the front of the knee, and when the handle at the side is moved either up or down, as the case may be, either the cross feed or the vertical feed is brought into action while the others are locked out, the feed being engaged or reversed by the handle on the front, the same as before. It is of the utmost importance that the reversing handle should be on the front of the machine, as it is often necessary to reverse the feed, especially in end milling, and if it is necessary to go behind the machine to make the change the advantage is lost.

All adjusting screws have collars graduated in thousandths of an inch, which is a great convenience when setting for depth of cut or other adjustments.

The feed variations are obtained by means of the feed change box at the rear, which consists mainly of a cone of gears revolving as one on a stationary stud, and an idler to engage with the different steps just as a belt might run on different diameters of a cone pulley. This arrangement is very simple and far superior to a great mass of gearing, each ruuning at a different speed on narrow bearings, difficult to lubricate and absorbing much power. The feed belt runs at high speed and is proportioned to give ample power for the heaviest cuts that the main belt will pull.

Aside from milling flutes in taps, counter-bores, and other tools, there is a great variety of work that can be handled to advantage by means of index centers, either on centers, held on an arbor, or in a chuck. The dividing head has a very large worm wheel, which is necessary to reduce inaccuracy and give added strength for cutting spirals on large diameters. The index plate is directly on the worm shaft, which further reduces liability of error, which must exist when the index plate is geared to the worm shaft.

The gear that is permanently attached to the dividing head for driving the worm when cutting spirals is completely covered and protected from dirt or accident, and does not interfere with the handling or ordinary operations of straight center work.

The change gears furnished provide a large range of spirals, which are so tabulated on a chart furnished with the machine that the operator has no trouble to select the right one.

The knee type universal milling machine will do a greater variety of work than any other machine tool, and a small experimental shop that can have only one machine will be best equipped with a machine of this class.

Any work that can be done on the face plate or in the chuck of a lathe can be done in a milling machine by holding an ordinary lathe tool in the swivel vise. A pair of bevel gears, for instance, can be bored, turned on the angles, the teeth cut, and the gears finished complete without ever having seen a lathe. A steam or gas engine cylinder can be bored, faced, and finished complete, and the fly wheel bored and turned in the same machine as quickly as it could be done in a lathe. While the milling machine is the best all around tool for the small shop it is the very life of the large one, and, generally speaking, the shop engaged in manufacturing machinery that does not contain two or more milling machines for every planer is a dark, dirty, dingy place, rapidly depreciating in value and managed by men who are not thorough mechanics, and who are hampered by discontented creditors, employees, and stockholders. Such shops will drag on for a time supported by their waning reputation, but commercial death is certain to follow mechanical stagnation.

Mr. Booker T. Washington, in his plea for industrial education among his people, tells of how he saw an Alabama negro marking off a corn field with an improvised marker drawn by a lazy mule who, in spite of the most furious urging, only moved at a snail's pace. Following this first negro was another dropping the corn

in scattered and irregular rows; then came a third with a hoe to cover the corn and the crop was planted.

The next scene was an Iowa farmer sitting under an umbrella, protected from the rays of the sun, on a modern corn-planter drawn by a fine team of horses which only needed to be restrained from going too fast, while all the surroundings testified to the farmer's prosperity.

What a trying thing it is to see a machinist work up a number of parts on a shaper or planer and then see another spend a day or two filing and fitting to make them go together, while it takes a helper five minutes to mix them up and another machinist a long time to sort them out and assemble in their proper places.

By way of contrast, a boy could have made them absolutely interchangable in the milling machine and they could have been drawn at random from the stock room and assembled without filing, fitting, or loss of time.

So our plea is for those who sit in darkness among the dusty scrap of their once famous shops. Are you using your milling machines to the best advantage, or have you discovered that they are too weak? If so, substitute a machine with a box section knee, without opening through the top. This is the weakest feature in old time millers.

If they are out of date and have small worm wheels in their dividing heads, no automatic feeds, or feeds that can all be engaged at once to confuse the uninitiated, or if it is necessary to go out of your way to reverse the feed, you need a change to secure better results.

It may be your own fault and not that of your machine because you have not had the courage to make or buy a cutter, or prepare a suitable fixture for holding a complicated piece, preferring rather to go on in the old way and saying that you have no use for a milling machine.

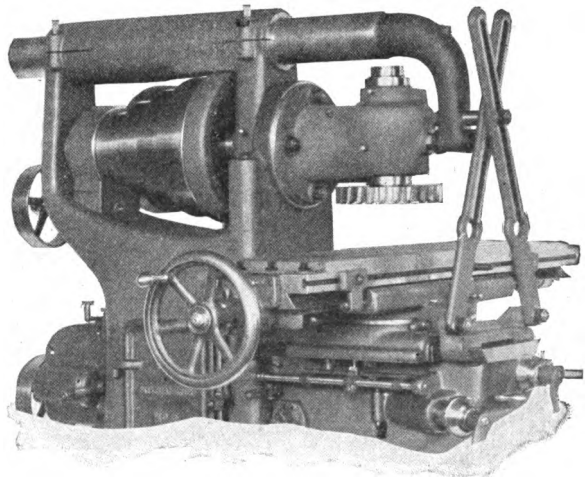


FIG. 2. FACE MILL ON VERTICAL SPINDLE ATTACHMENT.

In these days of close competition advantage must be taken at every point, no matter how small, to reduce cost and improve quality. A milling cutter that is making twenty turns per minute when it should make forty, and with a feed of 1-32" per revolution when it should be 1-16", is taking just four days to do one day's work. The machine should be capable of giving the cutter the right speed and feed, in other words, the cutter should be worked to its safe limit, but no hard and fast rules can be given for this; it takes experience, judgment and courage, and herein lies your opportunity.

The Fellows Gear Shaper.*

OF ALL the forms commonly used in machine construction, but two can be originated and proven correct. These are the flat and the circular. Those machine tools, the accuracy of whose work depends upon these surfaces—namely the lathe, the planer and the grinding machine—and these only, stand in the front rank as regards the accuracy of their work. No machine tool depending upon templet formed cutters is worthy to be classed with the lathe and planer. The Fellows Gear Shaper goes back to first principles and generates its tooth forms from flat and circular surfaces, which can be made absolutely true and proven so.

In the Fellows system, the derivation of the tooth forms from templates based on the geometrical properties of the tooth curve system is abandoned. In the involute system of teeth, the rack tooth profile is well known to be a straight line. Such a rack tooth profile is therefore easily originated with absolute accuracy.

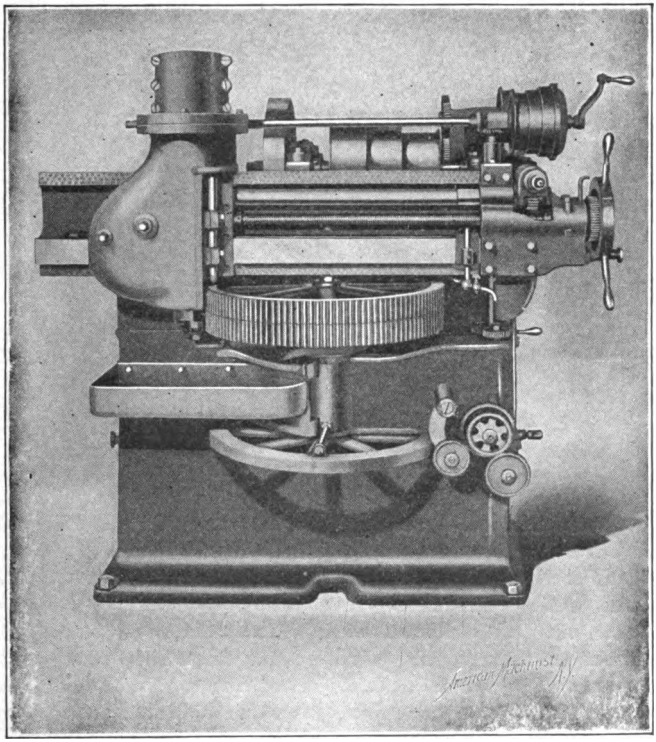


FIG. 1. 36 INCH GEAR SHAPER.

In the Fellows system this is done, and from the resulting profile the gear tooth profiles are generated by mechanical means on the principle of conjugate teeth.

The principle of action of the Gear

Shaper is shown in figure 2. The blank being inserted and the machine started, the cutter reciprocates on its center line. The cutter is then fed toward the blank and cuts its way to the proper depth. At this point both cutter and gear begin to revolve, the cutter maintaining its reciprocating motion. This revolution of cutter and blank is obtained by external mechanism, which insures that the movement shall be the same as though the cutter and blank were two complete gears in correct mesh. The combined result of rotary and reciprocatory motions is that the cutter teeth generate conjugate teeth in the blanks which mesh correctly with the cutter teeth and with each other. Any two gears of the same pitch cut with this cutter mesh correctly together.

Gear Shaper cuts a theoretically correct gear tooth. Because the tooth curve of the cutter is ground after it is hardened, the cutter and work cut by it approach nearer to absolute perfection than anything else produced in this line.

Only one cutter for each pitch is necessary. The investment in cutters is reduced 75 per cent. It will cut more gears than any other machine. An error in spacing is an impossibility. No depth gauge is required; the machine attends to that automatically.

The work is held by the "face plate system," by which the work spindle, the arbor and the work are drawn together as closely as if they were one piece. It cannot produce an incorrect form of tooth by setting the cutter "off the center." The

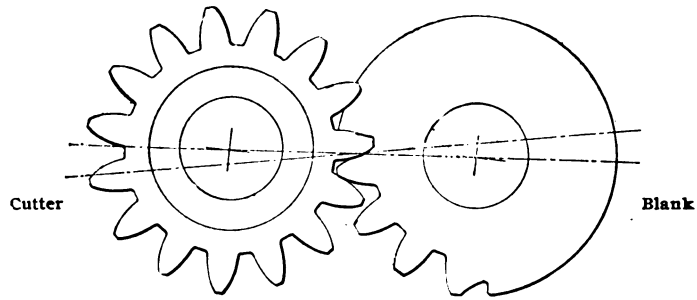


FIG. 2. CUTTER WITH PARTIALLY DEVELOPED CUTTER.

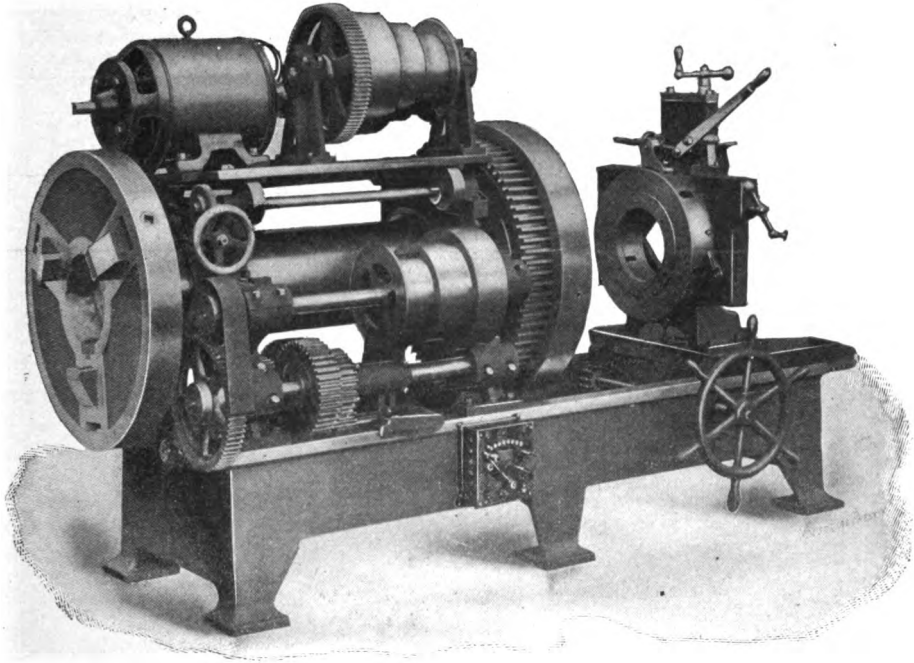
The prime object in working out this system was the production of better gearing than had heretofore been practicable. The important feature of output has not, however, been overlooked. There are several reasons why the cutter of the Fellows Gear Shaper will produce more work than the rotary cutter. Several teeth are in operation at the same time, making it practically a broad tool. There is not the loss resulting from the unprofitable travel of a milling cutter before it gets clear into the work, for with the Fellows cutter the overtravel is only enough to clear the work.

There are several distinctive features of the Fellows Gear Shaper, among which may be mentioned the following: The quality of work does not depend upon the operator. The "personal equation" is entirely eliminated. Given a certain cutting speed and feed, and the quality of the work is always the same.

The cutter travels the exact face of the blank only, whereas the milling cutter must travel from 10 to 40 per cent. more. A variation in diameter of blank or depth of cut does not produce noisily running gears. It will plane internal gears. Center distances can be exactly duplicated. It will plane into a narrow recess. Gear teeth cut upon this machine give the full theoretical bearing. Finally, gears cut by it are as superior to milled ones as the latter are superior to cast gearing.

An Electrically Driven Pipe Threading Machine.

THE illustration shows a No. 8 Duplex improved machine, with three horsepower Bullock electric motor attached. The same design is used in equipping all the Duplex machines, which are manufactured in six sizes, having a capacity from six to eighteen inches.



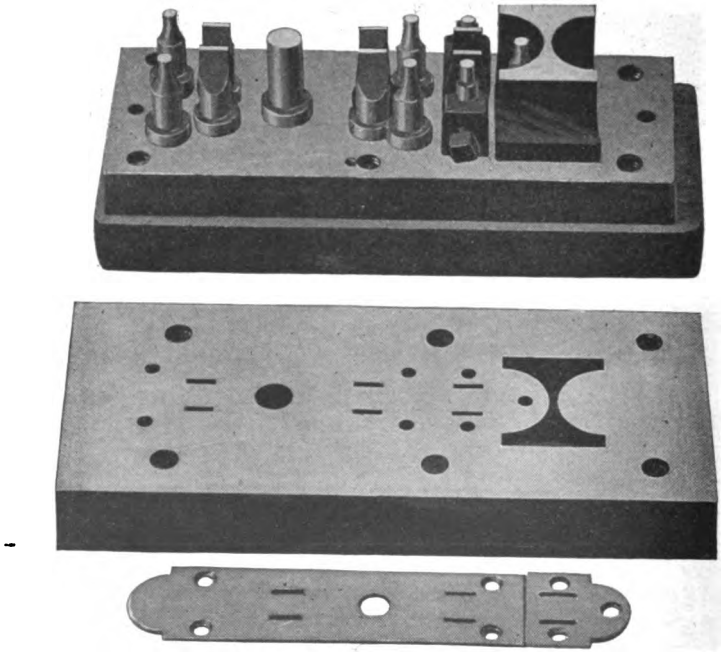
The motor is placed on a table directly over the main bearings of the machine; this table also supports a countershaft, on which a three-step cone pulley and a large gear wheel are securely fastened, the motor pinion meshing directly into this gear on the countershaft. One side of the table is held by a hinged bearing, the side of the main journal cap being designed to receive this support; the other side of the table rests upon two steel cams. The cam shaft rotates in bearings on the main journal caps, and by means of worm gearing the cams may be adjusted and the table elevated or lowered accordingly. This cam movement furnishes the means for tightening the driving belt on the cone pulleys; the belt naturally becoming loose through wear and stretch in the belt or the laced joint. The method of driving is exceedingly simple and very flexible in speed regulation. The controlling of motor speeds by means of resistance boxes is wasteful of electrical energy. In the present case the motor runs at a constant speed and the various changes in the velocity of the main shaft are obtained through the usual methods of the cone pulley. With three steps on each of these pulleys and the sliding gear on one of the shafts six separate speeds are obtained for the machine. The device for regulating

the height of the table, and thereby adjusting the tension of the belt compensates for the short belt drive, and the arrangement becomes as effective as the ordinary long belt design. The overhead connection demands no increase of floor space, and its convenient adaptation is a very desirable feature where there are no multiple-voltage or other systems allowing the speed of the motor to be accurately and economically controlled.

This line of pipe-threading machinery is manufactured by the Bignall & Keeler Mfg. Co., Edwardsville, Ill., for whom Hill, Clarke & Co. are agents.

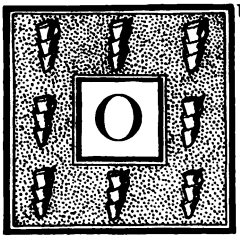
A Clever Die Operation.

THE accompanying illustration shows a set of dies for piercing, cutting off and rounding both ends of a steel switch plate at one stroke of the press, with practically no scrap. The plate is shown in cut as it comes from the dies. The steel to be cut is in long strips, about ⅛ or ¼ inch narrower than the large T-shaped hole in the die; the width of the steel depending on the dimensions of the shoulder desired, extending off the round end. The length of the stamping is governed by a gauge set at a definite distance from the rear end of the die; this gauge can be adjusted, the length of the stamping varying accordingly. Should it be desired to have only one end of the stamping rounding, the other end cut straight, or have one end conical the other end scalloped, this can be accomplished by making one or both ends of the large T-shaped hole the desired contour. These dies are made by the American Hardware Mfg. Co., of Ottawa, Ill.



SET OF DIES AND THE PRODUCT.

New Features of the No. 2 Friction Drill.



UR 20-inch improved Friction Drill can now be fitted with a Power Feed attachment, which with its other excellent features makes it one of the handiest drills of its size on the market today. Any speed of drill is instantly obtainable by simply shifting the foot treadle which controls the friction wheel. The friction disc is always clean and dry and does'nt throw oil as many others do. The thrusts from the spindle and from the disc are both carried on ball bearings, and reduce the wear to a minimum, making it a very easy running machine. The drill is most powerful when the speed is low and most sensitive when it is high, a feature to be appreciated.

This illustration on page 12 shows the 20-inch drill fitted with power feed attachment, and used as a belt driven machine. It may also be equipped with motor drive in a very compact and convenient form, with the motor on a column bracket, where it is out of danger of injury.

Where to Learn Shop "Kinks."

TO learn shop kinks, start a general repair shop with no capital, some ingenuity and a couple of second hand machines. Take every job that comes along and sit up nights figuring how spiral gears are to be cut in a lathe, how milling is to be done with a grinder, and various other things that will develop. Not only kinks, but tangles, will be among them.

When people come in and ask you if you can fix a sewing machine, a wringer, a baby carriage, an umbrella or a watch, tell them "yes" and take it, for if they are told a couple of times that your shop is not just equipped for that particular job, they won't come in with the next one, and the other fellow will get it. Do the work somehow, and you will find that the saying, "Necessity is the Mother of Invention," is true. Don't do the easy part of a job and turn the rest over to a shop with a larger equipment, for they will get the profit if you do, which is small enough on the whole thing anyway, and you will come out in the hole. By doing the hard part is just how to learn.

Start up a repair shop to find out how many impossible jobs are possible.

THE MECHANIC.

A Sample.

DES MOINES, IA., Feb. 27th, 1902.

HILL, CLARKE & CO.
Chicago, Ill.

Gentlemen:

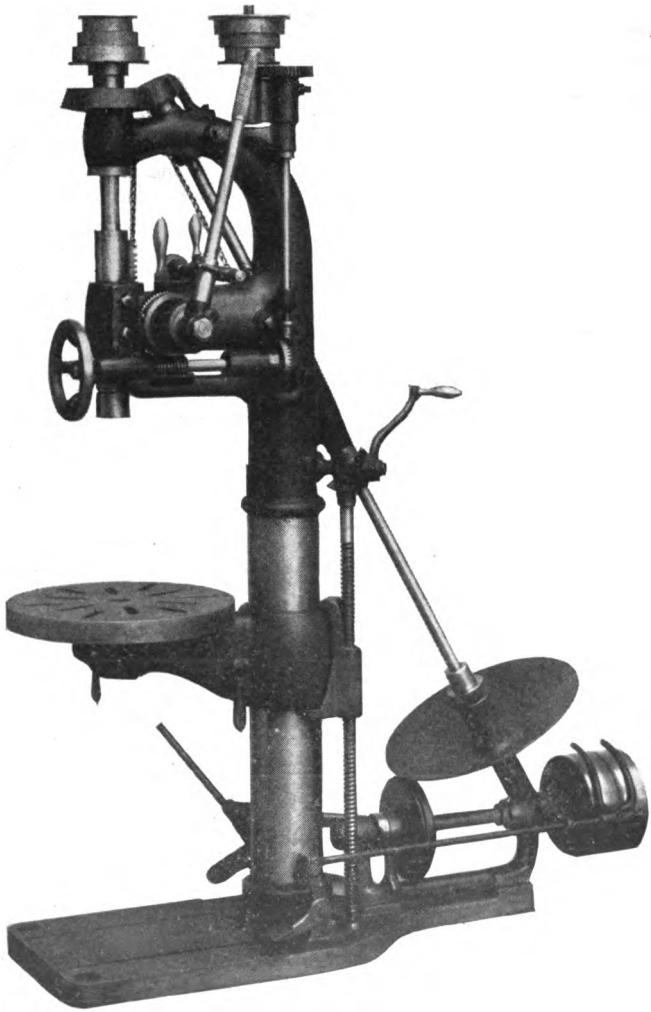
We take pleasure in writing you that we have recommended your Milwaukee miller to a firm at Newton, Ia., as the best that is and we could not use any other make, and receive such satisfaction as we do now.

We have also recommended your friction drill presses to three firms, all of this city. One of these firms have already bought and the others are going to purchase some kind, so we did the best we could for you.

Hoping this may do you some good we remain,

Yours very truly,
HOOPES BROS. & CO

An entirely unsolicited letter which speaks for itself. This is not an unusual one for us.—EDITOR.



20-inch Friction Drill with Power Feed.

See page 11.

EDITORIAL SHOP TALK

IT IS with pleasure that we begin a series of articles with this number on Milling Machine Practice, and particularly so, as coming from the pen of Mr. E. J. Kearney, who is so well qualified to write upon the subject. This first chapter on the machine itself will be followed by others on Cutters, Gears, Job Work, etc., and will form a series, when completed, of much value for the guidance of shop foremen and milling machine operators.

This is the season of the year for general repair shops to see to it that their equipment is all in good condition to attend to spring business. The automobile will be out in more force than ever before, the bicycle is here to stay, and many people still ride in carriages and wagons. There is no decline in the manufacture of sewing machines, and even they get out of order occasionally so that they necessitate a visit to the repair shop. You had better get your shop fitted up in the way it should go, Mr. Repairer, to take care of the rush. We have everything you want, both for big and little and can very likely fit you out with a second hand machine if you want to invest but little.

Questions for the Engineer.

SOMETIMES a very good engineer is "turned down" for a license because he cannot answer the questions propounded on examination. One such candidate suggests to the *Engineer's List* the following questions to be asked of engineers, which he doubtless thinks have as much bearing on the qualifications of an engineer as those he flunked on:

Who first boiled water?

What election district did Hero vote in?

Describe the difference between bracing a steam dome and bracing the boss for a riase; give bursting and safe-working pressure in both cases.

Does a knowledge of bluffing at poker assist an engineer in flimflamming an engineer?

Define the duties of an engineer on payday.

What relation does an engine cutting off at one-quarter stroke bear to oil at twenty-five cents a gallon?

Name four substitutes willing to take the place of the steam engine without a bounty.

What degree of saturation corresponds with good nature?

Is there any difference between absolute zero and the oil man's meeting by the engineer? Demonstrate adiabatically.

Describe the science of purchasing supplies without the aid of the least common multiple.

Give one safe way of losing a job and ten ways of holding it.

In case a steam boiler is about to explode would you prefer to interview the coroner or be viewed by him?

Do you believe in civil service, or do you think that real knowledge ought to count?

What is the boiling point of water at Pike's Peak?

What relation does tensile strength bear toward resisting "a pull?"

NOTES

THE Brown-Corliss Engine Company, Milwaukee, Wis., have completed their machine shop building at Corliss, near that city, have started their power plant and are now installing their equipment of machine tools.

Officers of the American Tin Plate Company and the Amalgamated Association have reached an agreement providing for a continuous scale, which will do away with strikes and the usual summer periods of idleness.

The strike of San Francisco iron workers, begun May 1 of last year to enforce a demand for a nine-hour day, has been ended, the men accepting a slight concession on condition that the National Federation will soon adjust the working conditions in the iron trades generally throughout the country.

The Cunard Company has decided to build two new steamers for the Atlantic passenger trade, which will eclipse everything afloat. These vessels will be over 700 feet long, with engines of 48,000 horse power, and will have a speed of 25 knots an hour. This should make the New York-Queenstown run about four and one-half days duration.

Charles M. Schwab has been re-elected President by the directors of the United States Steel Corporation. Other officers whose terms expired were also retained. Percival Roberts, Jr., a member of the executive committee, resigned because he does not agree with certain features of the policy Mr. Schwab supports. His successor was not named.

It is said the opening of navigation in the early spring will find the railroads facing the worst car famine in their history. With but little ore moving now and coal traffic also light, the railroads are unable to supply enough cars to carry coke to the furnaces, and with the opening of navigation, when ore and coal movement will be heavier, the situation is likely to be much worse.

After a two days' conference early in this month, the difficulties in the molding and polishing departments of the National Cash Register Company, of Dayton, O., were settled at the headquarters of the National Civic Federation. The company yielded on the points of contention, and the boycott of organized labor was removed. This is the first strike to be settled through the offices of the Federation, and is a good omen for the future, as it ends a contention extending over a period of two years.

The Grand Crossing Tack Company, of Chicago, has made plans for the erection of an industrial plant to cost $500,000 on the east side of the Calumet river, between One Hundred and Eighteenth and One Hundred and Twentieth streets. Contracts for the new plant have already been let. It is to consist of twelve buildings containing floor space of 70,000 square feet. There is to be an open hearth steel department, a rolling mill for the manufacture of steel billets, and all the accessories. The main building will be 440 feet long and have a width of 60 feet.

The Standard Steel Car Company, which is composed chiefly of the old officials and management of the Pressed Steel Car Company, have placed the contracts for their buildings, cranes and all their machinery equipment. They expect to locate handy to Pittsburg and be in operation by July. They propose to have a large establishment and manufacture steel cars.

Sixty-two employes of the United States Steel Corporation were called into the offices of the mills at Homestead, Bradford and Duquesne, recently, and presented with certificates of stock as a reward for faithful services performed. The stock was given outright, and can be disposed of or retained at the pleasure of the recipient. It is dividend paying, and all the men benefited declare their intention of holding it. The amounts given to different men vary from $1,000 to $50,000, according to the importance of their positions.

A bill has been introduced in the legislature of an eastern state to compel employers when advertising for help during a strike to state the fact of such a strike or lockout existing. Failure to do this incurs the penalty of $100 fine, $50 of which becomes the perquisite of the person making the complaint. Whether such a bill will become a law remains to be seen. Opinions differ as to its merits, and the compulsory clause. To non-union or free labor this proposed legislation would not furnish much of a scare, though it is not to be denied that labor in search of employment should be informed as to actual facts and not be misled or deceived.

"There are two common costly mistakes in business—wasting fine brains on routine work; trusting fine work to routine brains," says a maker of apparatus for saving time and producing accuracy in business offices.

"Shop Talk" 50c a year by subscription. Send us a half-dollar. Do it now.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 9.—Michigan—Young man for draughtsman, graduate of mechanical school, who has had experience in draughting and a knowledge of mechanics. $75.00 per month to right man. Address G. R. W., care of Hill, Clarke & Co., Chicago.

Opening No. 10.—Wanted, by a firm in Leavenworth, Kan., employing 60 to 80 men in machine shop department, a reliable, sober and competent foreman for the Machine Shop Department. Thorough mechanic, one who understands up-to-date methods of producing work economically and handling men. State experience, give reference and salary wanted. Address G. W. M. C., care of Hill, Clarke & Co., Chicago.

Application No. 25—Electrician—Young man, 19, with manual training and working experience, desires position as assistant electrician in Chicago or Milwaukee or vicinity; references. Address G. F. B., care Hill, Clarke & Co., Chicago.

Application No. 26—Mechanical draughtsman; graduate Manual Training School; holding position; prefers situation in or within 100 miles of New Haven, Conn. Address G. S. E., care Hill, Clarke & Co., Chicago.

Application No. 27.—Practical machinist, age 28, married, understands engines, boilers, pumps and mill work. Has done steam fitting and electrical work. Desires position as engineer in New England mill. Recommendations. Address R. A. M., care of Hill, Clarke & Co.

Application No. 28.—Superintendent eastern manufacturing establishment, 30, married, graduate University of Michigan, large shop experience; can systemize work and establish cost systems, design special machinery, jigs, etc., and handle labor. Only reason for changing is desire to move west. Address C. W. E., care of Hill, Clarke & Co., Chicago.

Application No. 29—Machine shop man, 28, married, 4 years shop experience on various work. Well educated. Desires to engage as salesman for machine tools, tool steel or shop supplies. Wants $15 a week and expenses to start. References. Address J. W. M., care of Hill, Clarke & Co., Chicago.

Application No. 30—Man with 20 years experience in the wind-mill, feed-mill and pump business, looking for connection with parties in that line. Invites correspondence. References. Address C. H. H., care of Hill, Clarke & Co., Chicago.

Application No. 31.—Practical mechanical engineer with wide experience in design, construction and installation of machinery; wood, iron and mason construction, and gas engine work. Thirty-six years old, married. Wants position as chief engineer or master mechanic for large concern. Something permanent. Salary of $2,500. Address F. E. S., care of Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come in our care will be published free of all charges including corresponding with the interested parties.*

The Throb Artistic.

YOU'VE heard of people who liked to buy books and magazines with uncut leaves because they took a sort of artistic delight in going through them with a paper cutter, haven't you? It often happens that they never read what is printed inside at all. It is just cutting the leaves and glancing through that gladdens their hearts. Well, sir, I know how they feel. I have the same thrill once a week. When I get the envelope

with my pay in it I know there isn't a cent there that I can have for my own use, yet, do you know, I simply can't help opening the envelope and looking in? It must be the artistic feeling that comes to the book lover. I can account for it in no other way. If I didn't care for that thrill I might just give the envelope unopened to my wife, and let her pay the money out. But the privilege of cutting off the end of that envelope and looking in is worth my whole week's work. After all, there's nothing like the artistic throb, is there?"—*Chicago Record-Herald.*

Suggestions to Engine Buyers.

A SIMPLE horizontal throttling slide-valve engine is to be recommended for low first cost, cheap fuel, small floor space, small operating skill required, medium or high speed.

A horizontal throttling compound slide-valve engine is to be recommended for medium first cost, fair economy, medium floor space, for pressures of 90 pounds and upward, small ability for operating, medium or high speed.

WANTED FOR SALE & TO EXCHANGE

Small Advertisements will be published in this department at the rate of ten cents for each 15 words (or fraction thereof). If desired, answers may be addressed in care of Hill, Clarke & Co. without further cost.

FOR SALE—Ames Turret chucking lathe and screw machine, 22 in. swing, 8 ft. bed, friction head, 3 step cone for 4 in. belt, 2½ in. hole in spindle, hexagon turret 15 in. in diameter with eight 2¼ in. holes. Automatic feed to turret slide. Address Hill, Clarke & Co., Boston.

FOR SALE—Clough Vertical Milling Machine with Slotting attachment. Table 20 in. long, 7 in. wide; movement 12 in. lengthwise, 6 in. cross wise, 18 in. vertically; capacity up to ⅝ in. mill heavy cut, up to 1¼ in. mill light cut; weight 800 lbs. Ordered by a customer whose work demanded heavier machine, and now offered at a bargain. In first class condition. Hill, Clarke & Co., Chicago.

FOR SALE—Flather Planer, 30"x30"x14', with two heads on cross-rail. Address Hill, Clarke & Co., Boston, Mass.

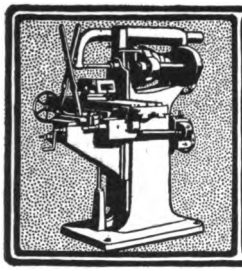
FOR SALE—One second-hand 4-horse power Gasoline Engine, complete with pipe fittings etc.; in good condition, Price, f. o. b. Chicago $150.00. Bargain. Hill, Clarke & Co., Chicago

FOR SALE—One Pawling & Harnischfeger horizontal Double Post Drill, with 7 feet vertical movement; table 48x60 inches, 15 feet of track; good condition. Hill, Clarke & Co., Chicago.

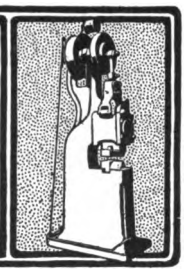
FOR SALE—One No. 5B Becker-Brainerd Milling Machine. Address Hill, Clarke & Co., Boston, Mass.

FOR SALE—One Johnson Engine Lathe, 30 in. swing, 24 ft. bed, complete with compound rest; built by I. H. Johnson, Jr. & Co., Philadelphia. Ordered by a customer who made a mistake in size—he needed a larger one. It is a standard lathe, just completed and ready for shipment. Address Hill, Clarke & Co., Chicago.

FOR SALE—John Adt Wheel Riveter. Will take up to 30-inch wheels. New machine, but will sell at very low price. Address Hill, Clarke & Co., Chicago.



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop and which rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

We are constantly buying machines of all sorts, and suggest that you write us for whatever you want. It may be we will have just the machine you need.

LIST OF SECOND-HAND TOOLS IN CHICAGO.

SECOND-HAND LATHES

One 13"x6' Am. Tool Wks. Lathe Comp. Rest and Power Cross-feed. Good as new.
One Fitchburg Lathe 15"x6'.
One Blaisdell Lathe, 13"x5'.
One 14" x 5' Engine Lathe.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot verfical movement, table 48"x60", and 15 feet of track, good condition.
One 2-Spindle Slate Sensitive Drill.
One Baush 8 spindle Multiple Drill, circular pattern.

SECOND-HAND SCREW MACHINES.

One ½" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No.2 Bardons & Oliver Turret Machine, plain head.

SECOND-HAND SPECIAL CAR BUILDERS MACHINES.

One Berry & Orton Tenoner.
One Berry & Orton Wall Saw.

SECOND-HAND SHAPERS.

One 12" Heavy Shaper.

SECOND-HAND PLANERS.

One 36"x36"x12' Wood & Light Planer.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Putnam Bevel Shear.
One No. 2½ Pratt & Whitney Cut-off Machine.

NEW AND FIRST-CLASS TOOLS IN CHICAGO

NEW BRAINARD AND OTHER MILLING MACHINES.

Write for Special Circular.

NEW TURRET LATHES.

One Bardons & Oliver No. 15 Brass Lathe, with friction back gears and set over turret.

NEW DRILLS

One Four-Spindle Fenn-Sadler Multiple Drill.
One Foote, Burt & Co.'s 3-spindle, Universal Adjustable Bench Sensitive Drill, automatic feed.
Two New 6 spindle Foote, Burt & Co. Multiple Drills. Circular heads. 14" drill circle. Capacity 5/8" drills.

HILL, CLARKE & COMPANY,

Better-best machine tools.

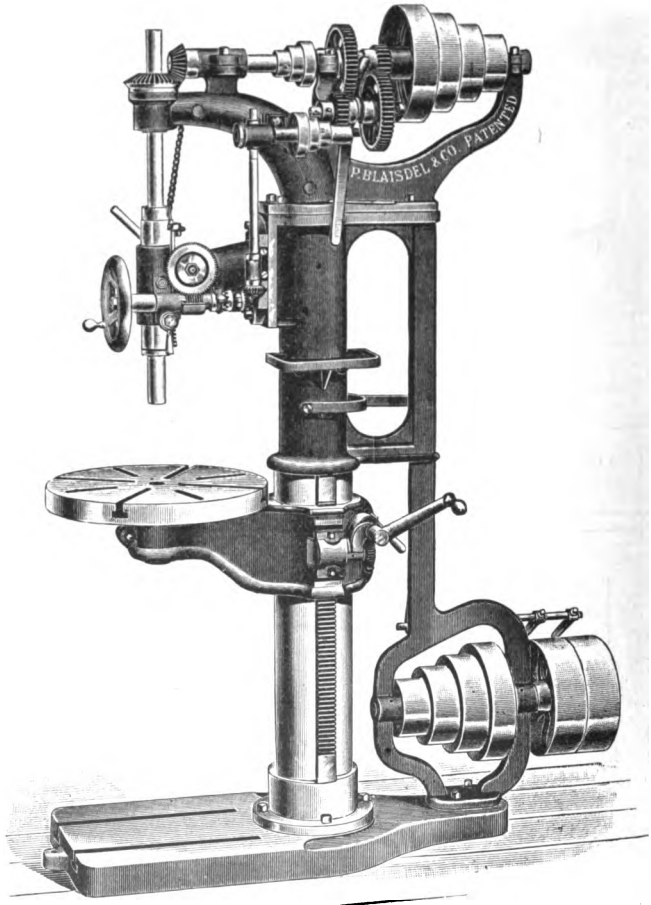
BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 253 Broadway.

What a Blaisdell Lathe Will Do.

OUT at Streator, Ill., Mr. Geo. Blake, who is general foreman of the machine shop for the Chicago, Wilmington & Vermillion Coal Company, finds a 22-inch Blaisdell lathe a good machine. Having some large work to do, he merely blocks up this lathe till it will swing 42 inches, and then turns up 1,800-pound wheels which are used on the motors for drawing up cars to their mines. Pretty good job for that sized lathe, isn't it?

20-Inch Stationary Head Drill

BACK GEARED AND POWER FEED.



Drill has revolving arm and table. Automatic stop.
Has steel spindle, with socket hole same as Morse Taper No. 3.
Countershaft has 9¾" pulley, 3" face; should make 350 revolutions.
Distance from table to end of spindle, 26".
Distance from base to end of spindle, 39".
Built plain with lever feed, or plain with hand-wheel feed; also with power feed with or without back gears.
For its swing there is no more powerful drill built.

P. BLAISDELL & CO. - - WORCESTER, MASS.

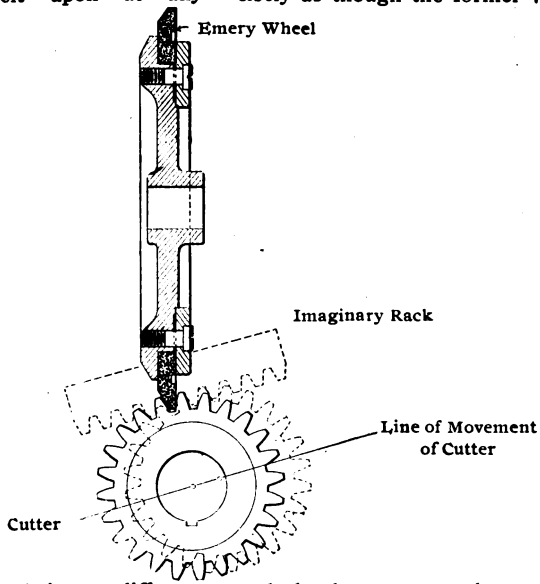
"Shop Talk"

FOURTH NUMBER OF THE SECOND VOLUME.
APRIL, 1902.

The Fellows Gear Shaper.

(Continued from March)

THE generation of the Fellows gear tooth profiles by the principle of conjugate teeth was spoken of in the article on the Fellows Gear Shaper in the March SHOP TALK, but the system was not dwelt upon at any length. This method is so different from all others, so ingenious and correct in theory that to explain it further we show this month in the accompanying illustration a diagram of the principle of the Fellows Cutter Generating Machine.



The emery wheel represents one side of an imaginary rack tooth, the complete imaginary rack being shown in dotted lines. The face of this wheel is dressed off to positive accuracy by a mechanically guided diamond tool. The cutter blank—already roughed out and hardened—is then rolled past the emery wheel in true rack and pinion motion, the cutter passing the emery wheel precisely as though the former were a gear and the latter a complete rack. This motion is obtained by steel tapes wrapped upon a disc, representing the pitch diameter of the cutter. While this movement is going on, the emery wheel grinds one side of the cutter

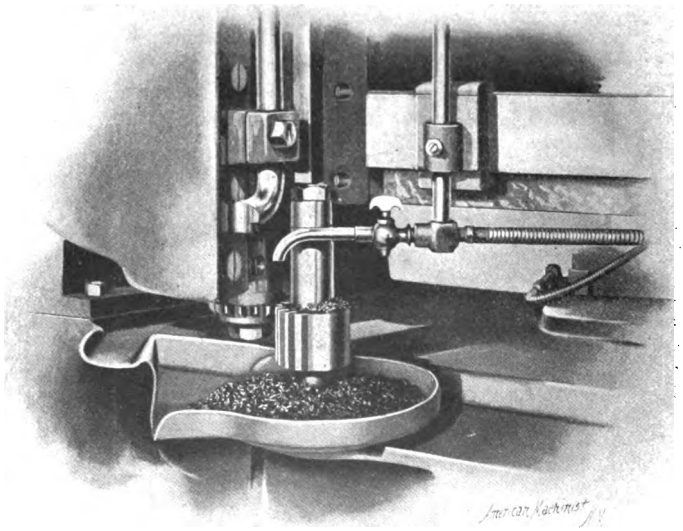
teeth to the correct form, one at a time, until the circle is completed, when the cutter is placed in a second machine, "left hand" to the first, and the opposite sides of the teeth are ground in the same way.

The resulting cutter will thus be seen to be a gear, the accuracy of which depends only on the truth of the flat side of the emery wheel, on the straight slide way on which the cutter is reciprocated and on the rolling motion. The accuracy of these can be made absolute, and the resulting cutter is one of the most minutely accurate forms known in mechanism.

Since the cutters are ground to shape after hardening, it is obvious that there can be no errors or distortions due to the hardening process.

The machines on which these operations are performed are completely automatic in all their functions. They are to be found only in the works of the Fellows Gear Shaper Co., who supply all cutters to users of their gear cutting machines.

The second illustration shows the gear cutter at work cutting steel. It may be seen what a clean sharp job is done. The cutter does not break out the metal of the blank in passing out. One reason is that, as the cutter has a top rake, the resultant effect is a shearing cut. Another is that on account of the crank motion, the cutter, at the point of leaving the blank, has a minimum cutting speed. Still another is that the finishing portion of the cut is the thin portion of the chip.



Milling Machines and How to Use Them.

Chapter II—The Cutters.

A PERSON buying a milling machine for general use, who has not had previous experience, is immediately confronted with the problem of cutters, and the question is frequently asked, "What should I buy for a starter?" and "What is likely to be required for my work?" It is to this class that these suggestions are offered rather than to those who, by years of experience and study, are prepared to give counsel and are not in need of it.

To begin with, do not, under any circumstances, buy up a lot of second-hand cutters because they can be had at a bargain, as they are liable to prove very expensive in the end for many reasons. They may be unsuited for the work, out of date in design, and will unconsciously be copied in the new cutters that are made, or they may be worn away so that further grinding is impossible and consequently useless.

The milling cutter cannot be too fine a piece of workmanship. The milling machine was created for it and all the thought and excellent workmanship put into these splendid machines is for no other purpose than to rigidly hold and revolve the cutter at the proper speed and to feed the work to it at a rate suited to the material being milled and the cutter doing the work.

The assortment of cutters shown in Fig. 1 makes a good set to put with the new milling machine. A wide range of work can be done with them, including the making of new cutters of almost any style or size. This set consists of two of No. 6 and one each of all the rest. No. 1 is a one-inch end mill arbor, suitable for shell end mills from 2¼ to 5 inches in diameter, and No. 7 illustrates an end mill 2½ inches in diameter to fit it. The arbor has a threaded col-

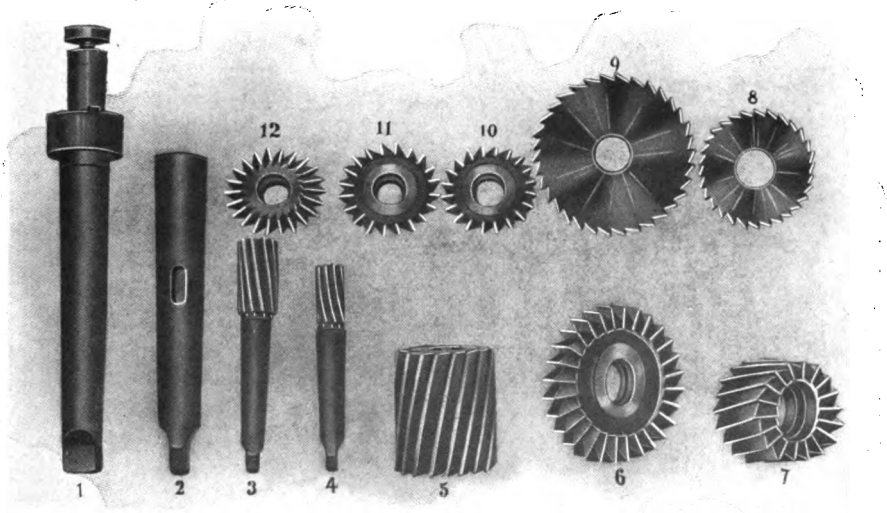


FIG. 1. A GOOD ASSORTMENT.

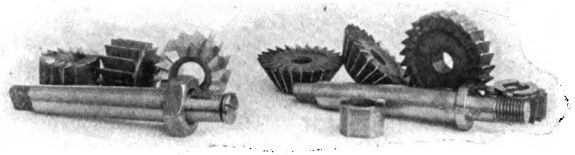


FIG. 2. END MILLS AND ARBORS.

lar with tongues to fit in the slot milled in the back end of the cutter for driving it.

The screw tapped into the front end of the arbor drops into the counter-bore in the cutter, thus keeping out of the way of the chips and holding the cutter in place. Fig. 2 shows two other styles of end mills and arbors, each of which have something to recommend them. The cutters shown in the group at the right are tapped 1 inch standard and have a slot milled across the back end to fit the loose collar, which is used to force off the cutter and serves no other purpose. If desired, the cutter itself could be extended and milled to fit a wrench, the only objection being that the cutter would be slightly more expensive.

The arbor shown with cutters to fit, at the left in Fig. 2, has No. 10 B. & S.

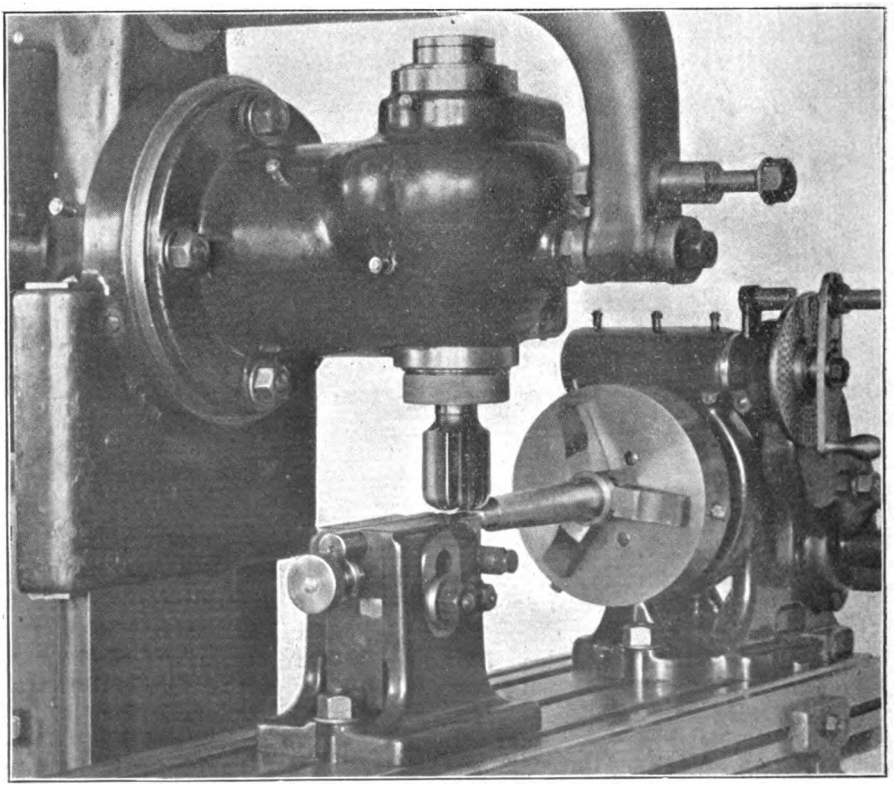


FIG. 3. SOLID END MILL AT WORK.

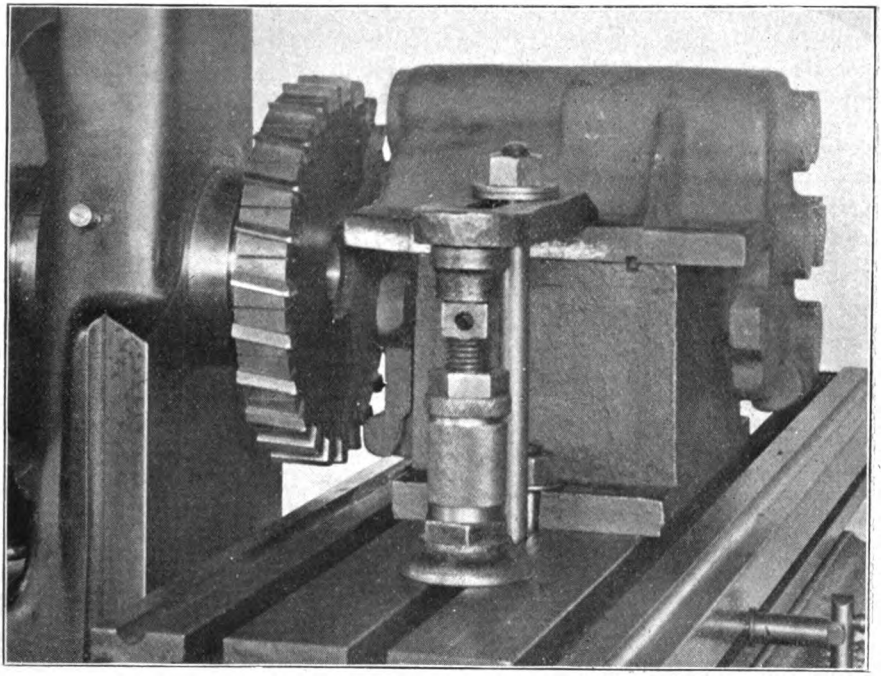


FIG. 5. INSERTED TOOTH CUTTER ON THE MAIN SPINDLE.

taper to fit in the machine, No. 4 Morse taper in front to fit the cutters and Woodruff key to do the driving. It has a nut to force the cutter off and screw to hold it on, the same as the screw in No. 1 of Fig. 1.

These three styles of arbors and cutters are excellent and any one of them will give good results. The threaded cutter is the cheapest because it does not require internal grinding or lapping, but for this reason it is not possible to attain the accuracy that can be had with the other two styles.

The straight arbor and cutters to fit are not expensive, are easy to make, and a high degree of accuracy can be obtained. The taper arbor and its cutter are perhaps slightly more expensive to make, because it is necessary that the cutter be ground internally to fit the taper. This is to be recommended when the most accurate work is required.

Shell end mills are very useful cutters and will be largely used whenever a milling machine is supplied with them.

Small end mills should be made solid, preferably with taper shanks (Nos. 3 and 4, Fig. 1), as the most accurate and satisfactory way to hold them.

A special solid end mill is shown in Fig. 3, milling tangue on the end of an end mill arbor. This cutter has No. 10 B. & S. taper shank, and is being used in the Vertical Spindle of a "Milwaukee" No. 2 Universal, the cross feed being engaged.

The Tail Stock in this miller is so constructed that large end mills can be used in the vertical spindle and mill close to the center.

End mills 5 inches in diameter and over should be made to screw directly on the end of the spindle and should have inserted teeth that can be renewed when worn out; this makes the cheapest form of cutter in the end. There are a

great variety of ways in which the teeth can be held in place. Very good cutters have been made by making the teeth a neat fit in the slots and then calking around them to slightly upset the metal.

Figures 4 and 5 are two views of the same cutter. The cast iron body in this case is cut between each tooth and a taper pin driven in to slightly spring the metal and rigidly hold the teeth in place. The illustrations show the use to which such cutters can be put.

The Spiral Surface Mill (No. 5, Fig. 1) is 2½ inches in diameter, 3 inches face and is one of a great variety listed by the cutter manufacturers whose practice is to make with straight teeth where the face is less than ¾ inch wide. This style of cutter, in widths to suit, is commonly used for key seating.

Cutters with side teeth (No. 6) could be used for key seating, but it is obvious that they would fall below size much sooner than the cutter without side teeth.

Teeth milled spiral will do better work on wide cuts than when milled straight, on account of the shearing cut, and for heavy roughing the teeth should be nicked as shown in Fig. 6. This can be done by cutting a coarse thread around the blank before milling the teeth.

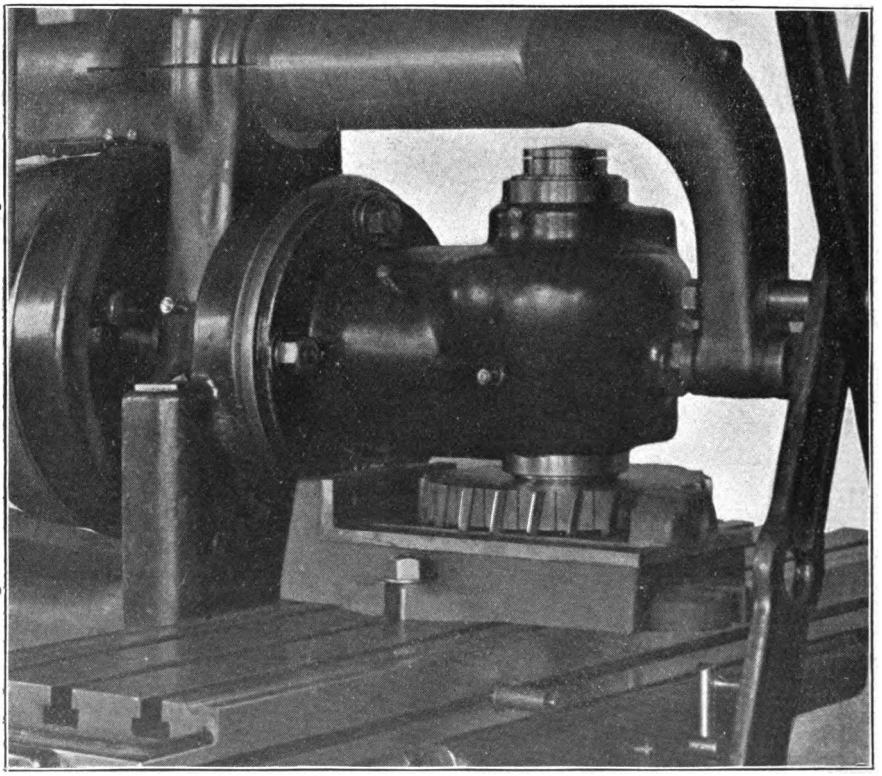


FIG. 5. INSERTED TOOTH CUTTER FINISHING A VISE

The side cutter is most useful in pairs for milling both sides of a piece at once, like squaring a tap shank; the cutters operating on opposite sides of the piece take away any tendency to spring and produce accurate work rapidly.

A gang of spiral surface cutters with side teeth, the inner pair made inter-

locking, is shown in Fig. 7. The teeth are cut spiral, right and left hand alternately, to balance any side thrust and to give top rake to the side teeth doing the cutting. The inner pair are made with clutch teeth to interlock, the bearing faces being cupped out to allow the clutch teeth to engage. Paper is used to extend the cutter as the sides are ground away, maintaining a constant size and insuring interchangeability. The same cutters can also be used for roughing and finishing by taking out some of the packing while roughing, and restoring the cutters to the proper width before taking the finishing cut.

For convenient handling it is well to fasten interlocking cutters together with three small screws; this will prevent the packing from being lost and makes it possible for the cutters to be ground and adjusted to size in the tool room. Cutters that can be ground without changing their form are indispensable for some classes of interchangeable work. They do not cut as freely as cutters with more clearance and should be used only for irregular shapes that are difficult to grind or when exact duplication of form is required. Fig. 8 shows a group of common forms. Care should be taken in grinding to have the face of the teeth radial; the tendency is to grind the point more than the base of the tooth, which places the cutting edge at a great disadvantage.

Generally it is more economical to buy standard cutters from the maker, and in many instances special ones also, but it is at times desirable to do some of this work at home, being cheaper if the tool room is properly equipped and organized, and the educational advantage of such work has a distinct value.

For making cutters, Nos. 10, 11 and 12 of Fig. 1 provides a good outfit. The first two have 60 degrees angles, one right and one left hand, and will suffice for most straight tooth work. No. 12 is for milling spiral cutters and has 12 degree angle on one side and 40 degrees on the other.

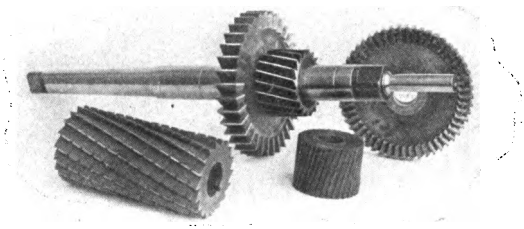


FIG. 6. SHOWING A NICKED CUTTER.

Practice has shown that it is best to make cutters with radial teeth. If they are under cut so as to give the cutting edge top rake, as in a lathe tool, it makes a weak tooth liable to break easily.

Formerly cutters were made with very fine teeth which gave little chip room; this was before the high-pressure days. Two such cutters are shown in Fig. 6, one a 6 inch side cutter the same size as the one on the arbor, and the other a spiral cutter with fine teeth nearly ground away. The change in practice is apparent from these comparisons.

There is far more danger of getting too many teeth than too few into a cutter.

If the cutter is small in diameter so that it will become too thin if the teeth are deep, take the first cut through at

the proper depth and then mill around again after revolving the work so as to bring the proper angle.

The end mills shown at the left in Fig. 2 are from 2½ to 3 inches in diameter and each has 15 teeth.

The angular cutters in Fig. 2 are too fine, especially the roughing cutter, which can be distinguished only by the clipped corners, the finishing cutter being carried out to a sharp point.

The most vital point in milling machine practice is that cutters of whatever design be kept sharp. A dull cutter is like any other tool that is dull—its efficiency is greatly reduced, the work produced is inferior, and the cutter wears rapidly away.

The same principle applies to the cutting edge of the milling cutter as to any other cutting tool for metal. If too little clearance is ground it will not cut well and if too much it will chatter; about three degrees will generally give good results. There is much more to tell, but lack of room precludes.

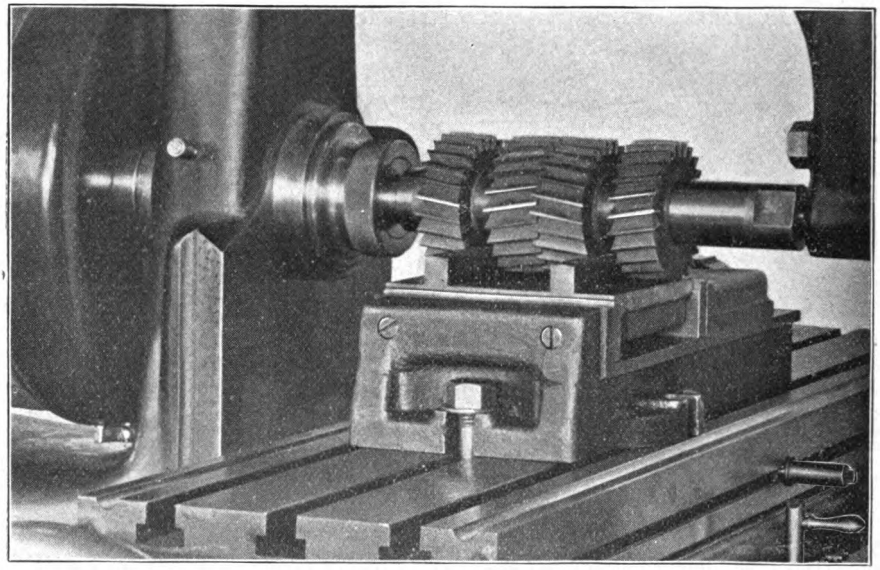


FIG. 7. FINISHING A VISE-BLOCK WITH A GANG OF CUTTERS.

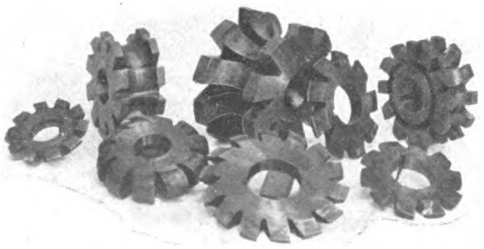


FIG. 8. A GROUP OF COMMON FORMS.

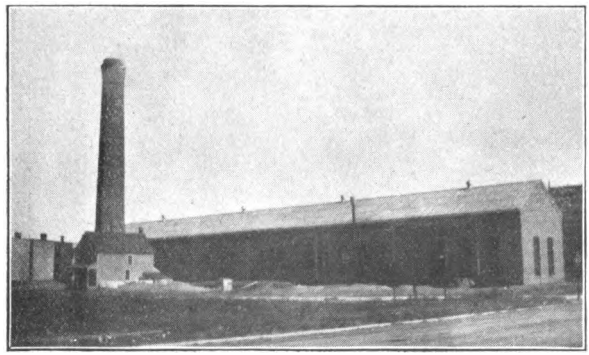
Smoke Consumption at the University of Chicago

By Morris Wisner Lee.

A LESSON in economy and smokelessness may be learned by many shop power plants from the heating and lighting plant recently installed at the Chicago University. Great efforts are being made at this time in Chicago to abate the smoke nuisance, and it is gratifying to see a large institution doing its best to aid the work and furnish a good example for others.

The plant supplies electric light and steam heat for the various buildings comprising the university, and to do this a battery of ten 150 horse-power boilers are required. The second illustration shows the boilers, each fitted with a Jones Underfeed stoker. The coal conveyors, which are to complete the equipment, were not yet installed at the time the photograph was taken.

The stoker shown consists of a steam ram with a fuel hopper outside the furnace proper, and a retort or fuel magazine and auxiliary ram within—tuyere blocks for the admission of the air being placed on either side thereof. The ram is actuated automatically by steam. By means of the ram and its auxiliary the fuel is forced underneath the fire, its movement being upward and backward. The green coal does not reach the fire, as it is coked before rising to the zone of combustion. A low pressure air blast is admitted through the tuyere blocks at a point above the green fuel in the retort, but below the fire, so that the air is mixed with the gases which are liberated from the coking coal below. This combustible mixture passes upward through the mass of burning fuel, thereby ensuring very complete combustion.

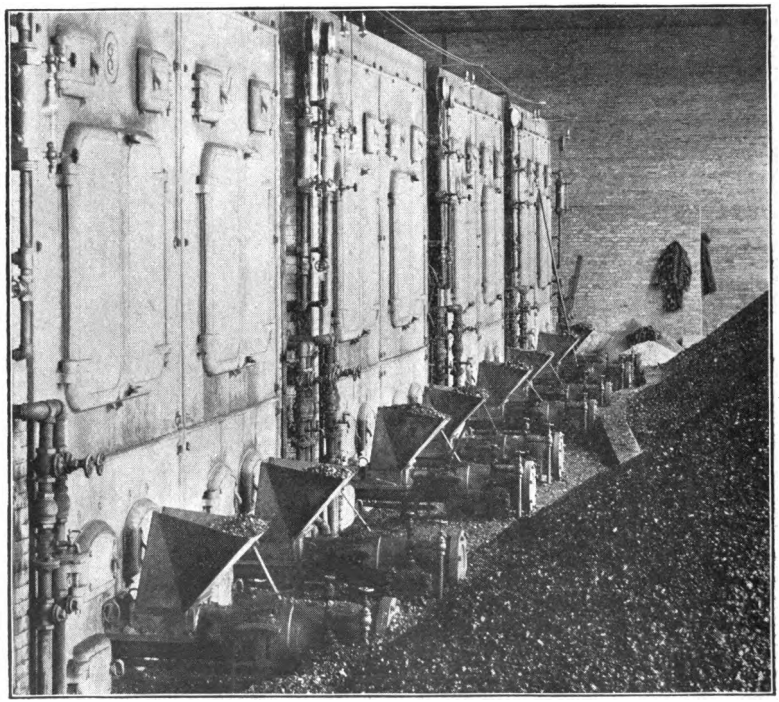


VIEW OF THE POWER PLANT, SHOWING THE STACK.

Mr. A. D. Houghton, who laid out this plant, combined several good ideas besides this stoker, and among them is the method for extracting a large amount of heat from the waste gases,

part of it in the economizer and part for heating the air used in the forced draft. Three tunnels extending lengthwise under the battery of boilers are employed for this purpose. There are two other similar tunnels in addition to these, but used for other things.

The hot gases after passing the length of the firebox and through the tubes, are led down beneath the boilers through the tunnel where the economizer pipes



PART OF THE BOILER ROOM, SHOWING THE STOKERS.

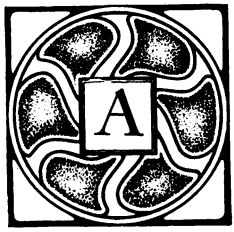
are placed. A large amount of heat is thus given up to the feed water. From there the gases traverse the length of the battery again through another tunnel filled with six-inch stove pipe through which the air for the forced draft is circulated. Stove pipe was considered rather an innovation, but thought to be the best for the purpose on account of its low price, and because the thinness of its walls would be most conducive to the ready transference of heat. In the event of corrosion after a time it is a comparatively simple and inexpensive matter to replace it. The air for the forced draft after completing the passage through the stovepipe, is turned into a collector tunnel directly underneath the fire boxes, and from there it goes up through the fire as above described. The fact that the temperature of this air is anywhere from 125° F. to 150° F. materially aids combustion and is a potent influence in the economy of the plant.

Owing to the circuitous route which the waste gases are obliged to traverse, the effect of the stack and the forced draft of 2 to 2½ inches of water is insufficient to keep them moving properly, so there is another small fan next to the

stack, which maintains an induced draft about equal to what the stack would produce if it drew the waste gases directly from the boilers. When the plant is running very light as is the case sometimes in summer, the waste gases may be sent from the boilers through a tunnel outside the building, and introduced into the stack direct, and in this case neither the forced nor induced draft are used, the height of the stack being sufficient for the purpose.

The accompanying illustration shows the amount of smoke when running eight boilers. The stack was observed for several hours and emitted no more smoke than this at any time. The engineer in charge, Mr. Frank N. Goble, who kindly showed the writer the salient features of the plant, said that there was some smoke while the fires were being cleaned, but this, of course, is only for a short period three or four times a day.

The New Flather 24-inch Shaper.



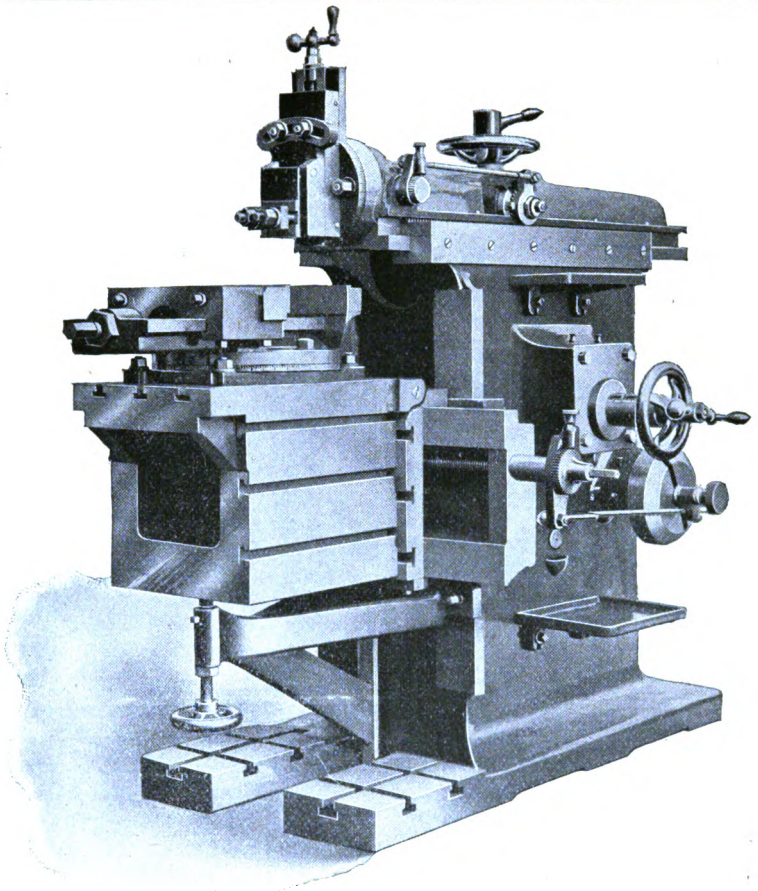
FTER many years' experience in building shapers, the Flather Planer Company have now brought out a new and larger size, which is shown in the accompanying illustration. This shaper is made to plane 24 inches long, 25½ inches wide and 15 inches high, and embodies several new special features as well as all those of their previous machines.

The machine is powerfully back geared, and all the gearing is contained in the cone pulley, entirely out of the way. Clutches for the gears are on the driving shaft inside the column and are operated by a lever on the back of it. Great power is obtained by means of this new arrangement, and application for patent has been made. Sixteen changes of speed may be secured in connection with a friction countershaft. A new friction power down feed for the head is furnished, and at a slight extra cost an automatic stop can be provided for the saddle on the cross-rail, by which the feed to the saddle is thrown out instantly at any given point when feeding in either direction.

The machine is fitted with a combination of the Whitworth quick return and the slotted lever crank movement, which makes the quickest return movement of any shaper made and the most uniform cutting speed of any crank movement used at the present time, without shock or jar. There is a handwheel on the top of the ram, by which the ram can be quickly brought to any position desired while the machine is running and cannot slip. A graduated collar shows the length of stroke the ram travels. Another good point is the adjustable slotted lever, which, as the lever wears, can be adjusted and still retain its rigidity.

The crank pin is adjusted by a scroll and two racks so that it is impossible for it to slip, either when tightened by the hand-wheel, shown on side of machine, or when loose. The stroke can be changed while the machine is in motion as readily as when it is at rest, and can be changed from full stroke to zero in three seconds.

The angle-piece for supporting the box-table is bolted to the lower edge of the cross-rail, has an adjustable bearing on the outer edge of the box table, and the lower end bears on a rib cast on the front of lower part of the column which projects as a bearing for the raising-screw. The support is directly under the cutting tool at all times, being raised and lowered with the cross-rail, which makes it unnecessary to adjust it



THE NEW 24-INCH SHAPER.

whenever the position of the cross-rail is changed.

The pitman is directly pivoted to the slide block in the ram, and the lower end slides on a shoe that has a pivotal motion on the shaft through the center of the column. This motion still further increases the uniformity of the cutting speed and allows the pitman to be made "yoke" shaped at the upper end, so that a long shaft can be run through the center of the column for key-seating or other work. This motion also allows the large gear to be placed close up to the underside of the ram, thus reducing to a minimum the tendency of the pitman to spring and chatter, as it would be apt to do if the gear was set low in the column.

This is a most excellent machine.

EDITORIAL SHOP TALK

ADVERTISING has at this time grown to such proportions, and so much thought, hard work and ingenuity is used in getting up advertisements of all sorts for various magazines and papers that those pages have become quite as interesting, if not more so sometimes, than the regular reading matter.

At the bottom of every page and scattered through the middle of some is this little sentence in italics—"Please mention this paper," or "Mention McLoor's Magazine when writing to advertisers," etc., etc. Now why is this? Simply because advertisers want to know from just what source their orders come. They pay for space and want to know what they get in return the same as if it were merchandise. They have to know in order to advertise intelligently and profitably. If they carry an advertisement in a number of mediums and the replies coming in mention one or two of these more than others they will get an increase, or at any rate a continuance of business, which is only just and as it should be.

Some people in answering an advertisement will never say where they saw it because they think they are doing a good turn for the publisher. Others are merely unobservant or indolent about it. For these people the "keying" of advertisements proves useful, but it is not always practicable to key an ad. They do not realize, perhaps, that it gratifies the advertiser more than it does the publisher to know which advertisement bore the most fruit, and that this simple act of mentioning where they saw the ad. places dealer and customer in more cordial relations.

So it helps all three—customer, advertiser and publisher, and at what a small exertion! It enables the advertser to know what he gets when he buys space, the customer to get good service, and the publisher merely his just due, i. e., credit for results. Nobody ought to think it too much trouble to say where they saw an advertisement when they think it over a moment. Only these words, "I saw it in So-and-So"—that's all.

There is now an increasing number of advertisers in SHOP TALK. We want to keep them and we want more. SHOP TALK is an excellent medium. We know it brings results which are perhaps not credited to it, and we want to prove its value to our advertisers who have ads in others papers as well. So we ask you to say, "Saw it in SHOP TALK" when you write or order. It's a little thing to do and it helps you, helps the advertiser and helps us. Mention SHOP TALK.

THE next issue of SHOP TALK, the May number, will be a special number, double size and double circulation. That means 48 pages and 20,000 copies, which will reach machinery buyers and users all over this country, and in many others. We will present some new machines therein, de-

signed and built under our personal supervision. It is needless to say that they will be the best and latest developments in their line. Hill, Clarke & Co. tools have that reputation.

We are certain that this special issue will be a very good proposition for advertisers. SHOP TALK brings an immense amount of business to us, and it will do the same for other advertisers, because of the class of people to whom it goes. And 20,000 copies, that is a lot of users and buyers of machinery and appliances of all descriptions.

The rates for this special issue will be $40 for a full page (14 inches, or 200 agate lines); $25 for a half page (100 agate lines), or $15 for quarter page (50 agate lines). Less than quarter page, $0.40 per agate line (2⅛ in. wide).

This special issue will be sure to bring business to your doors, and we are glad to extend to advertisers this opportunity. Advertising copy should be in our hands by the end of this month to ensure a good position, and not later than May fifth in any event.

SOME days ago we received an unsigned communication from some person in an eastern state occasionally mentioned for its culture, and this note characterized our request for fifty cents subscription to SHOP TALK as typical of the "wild and wooley, tempered and fostered in the windy city"—whatever that means. We are not quite sure. We only know that the Indian uprisings around Chicago have become quite rare the last few years, and we are of the opinion that the writer of this missive has never crossed the imaginary boundary line of his state.

If there is anyone who cannot derive more than fifty cents' worth out of twelve numbers of SHOP TALK, we want him to say so and sign his name. We think that one such article as Mr. Kearney's, in this number, on Milling Machine Cutters, is worth more than the price of a year's subscription. That price is merely nominal and was decided upon because of the enormous growth of our mailing lists from requests for the receipt of SHOP TALK. With the many articles on machine tools, the occasional "shop kinks," the descriptions of new tools, and discussions of shop practice, we consider fifty cents a very small contribution.

Dooley on Editors.

'TIS a hard job," said Mr. Dooley, "but 'tis a fascinatin' wan. They'se nawthin' so hard as mindin' ye'er own business, an' an iditor niver has to do that."

"I shud think th' wurruk wud kill thim," said Mr. Hennessy, sadly.

"It does," said Mr. Dooley. "Manny gr'reat iditors is dead."

NEWS & NOTES

THE African Concessions Syndicate of London will shortly be dispatching a deputation to Africa to survey the Victoria Falls with a view to getting out plans for an electrical installation which will be worked by power from these Falls, whose height is said to be 420 feet and whose width is about a mile. The syndicate estimates that the water passing over the Falls is many times greater than at Niagara Falls. It is thought that it will be found possible to apply electrical energy generated at the Falls for working about 300 miles of the Cape-Cairo Railway, viz: 150 miles north and 150 miles south. Another suggestion is that the tramways of Bulawayo, which is 240 miles away, may be done from this station. The enterprise is, of course, at the moment only in the preliminary stage.

The entire 7,500 horse-power generated by the Economy Light & Power Company, Joliet, Ill., has been leased and there is a demand for 2,000 more horse-power. The Illinois Steel Company makes this demand, as it intends to operate its mill machinery therefrom. The Bridgeport pumps in Chicago will use 500 horse-power from the plant, and the Chicago Edison Company is to have 2.000 horse-power for lighting purposes in Chicago. The Economy plant will be enlarged to its full capacity.

It is reported that British and European ironmasters are working towards a consolidation to keep up the prices, in view of the demand for pig iron and steel from America. The idea is to agree upon a rate on which to sell to America in order to prevent competition among themselves, which would tend to reduce prices.

The French Chamber of Deputies have passed the bill providing for the participation of France in the St. Louis Exposition. The bill provides for an appropriation of 600,000 francs, to be applied solely to an exhibit of fine arts and textile manufactures, which will cover a floor space of nearly ten acres. France is preparing to surpass all her former displays at American expositions and wants to surpass all other foreign countries represented there as well.

In building the new bascule bridge across the Chicago River at Randolph street a new invention is being successfully applied in the construction of the piers. This consists of a water-tight steel sheathing used in the construction of the cofferdams for the piers, and is the first of its kind ever used in this section of the country. The sheathing, besides having great strength, it is the only water-tight cofferdam ever built in the river. It is composed of a series of channel bars, bolted together in pairs and connected end to end by "I" beams, forming an absolutely water-tight fence, extending out into the river, enclosing the area in which the pier is to be constructed. While the sheathing is more economical than the old style, it also takes up less room than the old ones and therefore hinders traffic less.

The Lucas Machine Tool Company, of Cleveland, Ohio are preparing plans for a modern brick factory to be erected at Glenville near Cleveland. The factory is to be of the saw tooth type, 150 feet long, and strictly fireproof throughout. Two bays are to be erected at present with provisions for additional ones later on.

NOTICE.

Change of New York Address

AFTER April 15th, our New York store will be at 123 Liberty street, where there will be more scope for showing our line of machine tools. The office entrance will be at 153 Greenwich St. Please note this change.

Change of New York Address

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 10.—Wanted, by a firm in Leavenworth, Kan., employing 60 to 80 men in machine shop department, a reliable, sober and competent foreman for the Machine Shop Department. Thorough mechanic, one who understands up-to-date methods of producing work economically and handling men. State experience, give reference and salary wanted. Address G. W. M. C., care of Hill, Clarke & Co., Chicago.

Opening No. 11.—Wanted, two or three young draftsmen, on general shop work and details tracing, etc. Pay according to capability. Those with some shop experience preferred. Good opening for young men. Address, H. E. Harris, care of Murray Mfg. Co., Tottenville, P. O., N. Y.

Application No. 27.—Practical machinist, age 28, married, understands engines, boilers, pumps and mill work. Has done steam fitting and electrical work. Desires position as engineer in New England mill. Recommendations. Address R. A. M., care of Hill, Clarke & Co.

Application No. 29—Machine shop man, 28, married, 4 years shop experience on various work. Well educated. Desires to engage as salesman for machine tools, tool steel or shop supplies. Wants $15 a week and expenses to start. References. Address J. W. M., care of Hill, Clarke & Co., Chicago.

Application No. 30—Man with 20 years experience in the wind-mill, feed-mill and pump business, looking for connection with parties in that line. Invites correspondence. References. Address C. H. H., care of Hill, Clarke & Co., Chicago.

Application No. 31.—Practical mechanical engineer with wide experience in design, construction and installation of machinery; wood, iron and mason construction, and gas engine work, Thirty-six years old, married. Wants position as chief engineer or master mechanic for large concern. Something permanent. Salary of $2,500. Address F. E. S., care of Hill, Clarke & Co., Chicago.

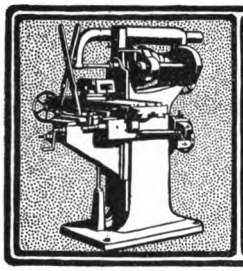
Application No. 32. Young man aged 19, wants place as machinist with opportunity of learning the trade. Has had some experience, and is taking a correspondence course in that line. Address J. E., care of Hill, Clarke & Co., Chicago.

Application No. 33.—Practical Mechanical Engineer, 54 years old, first-class health. Has had wide experience from apprentice boy to superintendent. Wants to better his present position financially. Good references. Address W. B. Y., care of Hill, Clarke & Co., Chicago.

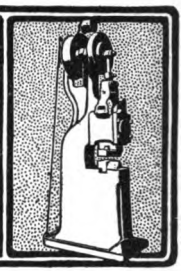
Application No. 34—Position wanted as Superintendent or foreman of machine shop by an American, age 35. Well up in modern shop practice. Good organizer and disciplinarian. Has good education and can furnish good references. Applicant is known to this office. Address E. E. W., care of Hill, Clarke & Co., Chicago.

Application No. 35.—Position wanted as assistant electrician by young man, aged 19, will graduate this June from Southern Mechanical College. References. Address, F. M. J., care of Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come in our care will be published free of all charges including corresponding with the interested parties.*



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

LIST OF SECOND-HAND TOOLS IN CHICAGO.

SECOND-HAND LATHES

One 13"x6' Am. Tool Wks. Lathe Comp. Rest and Power Cross-feed. Good as new.
One Fitchburg Lathe. 15"x6'.
One Blaisdell Lathe, 13"x5'.
One 14" x 5' Engine Lathe.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One 2-Spindle Slate Sensitive Drill.
One Baush 8 spindle Multiple Drill, circular pattern. For 1" Drills.

SECOND-HAND SCREW MACHINES.

One ½" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No.2 Bardons & Oliver Turret Machine, plain head.

SECOND-HAND CYLINDER BORER.

One Sellers Cylinder Borer, with facing heads. Will bore and face 30" cylinders and is in fine condition.

SECOND-HAND SHAPERS.

One 12" Heavy Shaper.

SECOND-HAND PLANERS.

One 24"x24"x6' Flather Planer, in fine condition.
One 36"x36"x12' Wood & Light Planer.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Fisher Boiler-Plate Chipper.
One No. 2½ Pratt & Whitney Cut-off Machine.

NEW AND FIRST-CLASS TOOLS IN CHICAGO

NEW BRAINARD AND OTHER MILLING MACHINES.

Write for Special Circular.

NEW TURRET LATHES.

One Bardons & Oliver No. 15 Brass Lathe, with friction back gears and set over turret.

NEW BORING MILL.

One 37" Baush Boring Mill, double head.

NEW DRILLS

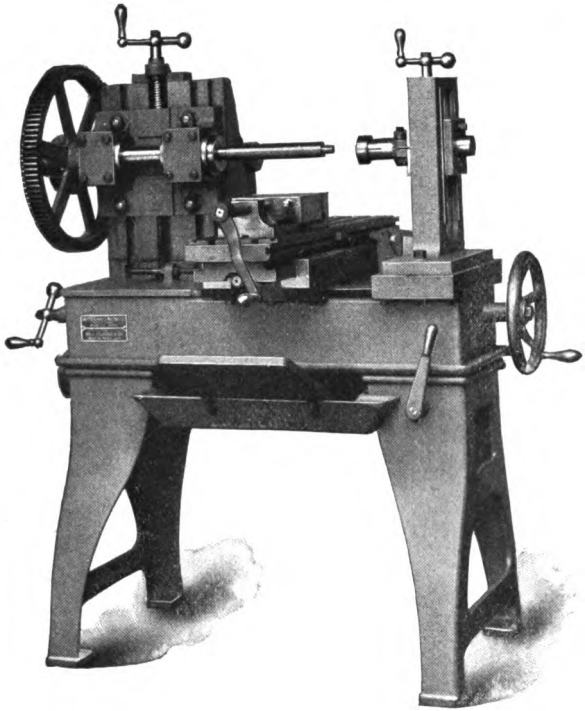
One Foote, Burt & Co.'s 3-spindle, Universal Adjustable Bench Sensitive Drill, automatic feed.
Two New 6 spindle Foote, Burt & Co. Multiple Drills. Circular heads. 14" drill circle. Capacity ⅝" drills.

HILL, CLARKE & COMPANY,

Machinery Merchants.

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance, 153 Greenwich street.

Automatic Feed 18 inches



Size of Table 32x8 inches

We have been selling a great many of the

No. 2 Improved Lincoln Milling Machine.

And every customer says it is the most powerful machine of its kind that is made.

When you need one let us know. Circular is free. Why don't you ask for it?

Hill, Clarke & Company,

Machinery Merchants

BOSTON: at 156 Oliver street
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance at 153 Greenwich street.
PITTSBURG REPRESENTATIVE: Chas. G. Smith Co., 347 Fifth avenue.

When writing, please say you saw it in SHOP TALK.

'Shop Talk

FIFTH NUMBER OF THE SECOND VOLUME.
MAY, 1902.

A New Method of Lighting Drafting Rooms.

BY NORMAN LEE.

ONE of the most serious problems which confronts the architect in the construction of a large building, is its proper illumination during the dark hours of the day. In the case of an office building where the rooms are small, the problem is not so difficult; but in satisfactorily, and yet economically lighting a reading room, library or audience room, it becomes much more serious.

In the case of a drafting-room it is very essential to have the best illumination possible, and as no existing method of lighting is entirely satisfactory, the University of Wisconsin, with a desire towards bettering the present drafting-room conditions for its engineering students, has found through an experimental investigation carried out by two engineers of the 1901 class, a most satisfactory method of artificial illumination.

To be satisfactory, artificial lighting, as applied to drafting-rooms, should conform to at least four conditions. First, the source of light should be hidden, for when the direct rays of light strike the eye, the pupil contracts to shield itself from the dazzling effect, and so the workman does not derive the benefit of the full amount of light. Second, there should be a sufficient amount of light for the comfort and good workmanship of the draftsman. Third, the quality of light should be as good as possible; and fourth, it should be distributed uniformly and in such a way as to cast as few direct shadows as possible.

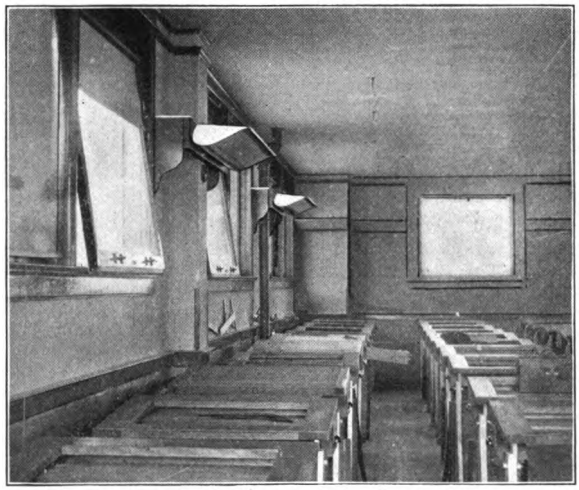
A method of indirect illumination consisting of first reflecting the light from the lamps to the ceiling, and then from the ceiling to floor and desks, was found to conform most nearly to the required conditions. And though this system seems simple when found, a number of problems arose before it could be satisfactorily worked out.

The first of these various problems was the determination of the reflecting surface, for since by the first condition, the source of light must be hidden, it can readily be seen that a polished surface producing an image, was out of the question. A large number of substances were tested with a photometer, for the amount of light reflected from them, and fortunately hard white plaster, or white sanded calcimine finish was found to be very good, reflecting about 80% of the total light incident upon it. For the reflectors, however, various paints were tested, and zinc white mixed without oil, laid on in three coats, was found to give the best results. Both of these surfaces are almost pure white, and not being polished they do not reflect the light in a glare.

To find the shape of the reflector giving the required even distribution of light, was the next question, and to begin with, a curve was laid out by mathematics, calculated to suit the conditions,

and a reflector was made conforming to this curve. For the purpose of testing this reflector, a light tight room was partitioned off in one of the buildings, and its floor was divided into spaces a yard square. The reflector was then fastened to the wall and with the lamps in it turned on, each square yard was photometered for the amount of light falling on it. In this way it was found that, so far as giving an even distribution of light, the original curve was considerably in error, due to the fact that it was calculated considering the light as coming from a point, while as every one knows, the filiament of an electric bulb is very appreciable in length and breadth. The shape of the reflector was then altered to correct this error, and the room was photometered as before. Proceeding in this way some twenty shapes of reflectors were tested at different distances from the ceiling and with different arrangements of lamps in them, before one was found to be sufficiently satisfactory. The final shape chosen, as giving the best results, is very well shown in the accompanying photograph.

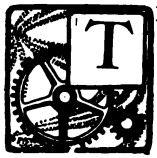
A system of lighting constructed in accordance with the data found in the above manner, is now in use in one of the drafting-rooms of the Engineering Building in the University of Wisconsin, and needless to say, that after dark this room is the most pleasant and restful to work in. In this room the reflectors, which are made of sheet iron bent to the correct shape, are painted the prescribed zinc white on the inside, and the lamps are fastened in them every 10 inches or so in a horizontal position, by means of lugs which project up from the bottom. These reflectors are fastened all around the room on the walls, at about 2½ feet from the ceiling. The wiring is neatly done through the walls, so that there are no unsightly wires as in the case of drop lights, and the outsides of the reflectors are painted a suitable color to harmonize with the room, presenting in all, a very neat appearance.



A CORNER OF THE DRAFTING ROOM AT WISCONSIN UNIVERSITY.

When the lights are turned on by means of a convenient switch on the wall, a soft even light seems to come from the ceiling. Reflected as it is, from a dead white unpolished surface, it more closely resembles daylight than anything I have ever seen, and even when the head is bent right over the work, the distribution of light is so perfect that there is a very noticeable lack of shadows.

An Enormous Shaper.



THE Morton Manufacturing Company has just finished and has now in successful operation at its works at Muskegon Heights what is believed to be the largest iron shaper in the world. The machine weighs approximately twenty tons, and occupies a space eighteen feet long, twelve feet wide and eighteen feet high. Its extreme length is sixteen feet and the main bed of the machine weighs over six tons.

The machine consists of a heavy bed plate, which is suitably ribbed and cross-ribbed so as to give the casting the greatest degree of stiffness, and provided with slots for bolting it to the floor plate. Fitted to this bed is a large vertical column which is provided with square rail bearings. To this column is fitted a vertically moving apron which carries the power feeding mechanisms of the machine. This apron or saddle carries a huge steel ram, the dimensions of which are ten inches by twelve inches by twelve feet long. This is a hollow steel casting, weighing twenty-two hundred pounds in its finished state. Within this ram and journaled at its extremities is a Bethlehem forged steel arbor which is also hollow and serves the purpose of carrying the milling or rotary cutting head which is used for milling off spots on the sides of large castings. To the outer end of this ram is attached the head which carries the cutter for shaping.

The machine is built on the principal of the draw cut, which is characteristic of the Morton machines.

The apron and other feeding mechanisms have a vertical adjustment on the column of six feet and the ram has a travel of six feet. The column will travel longitudinally on the bed ten feet. The power is supplied to this machine by an electric motor, and an auxiliary motor is also supplied for raising and lowering the apron on the saddle and moving sideways for purposes of adjustment

One novel feature of this machine is the air counterbalance. This consists of an air cylinder located in the rear of the machine, with a direct-connected air compressor, which is so arranged that the pressure is automatically regulated. When the air pressure is raised to the proper limit, the vertically moving portions of the machine are perfectly counterbalanced, thereby making it feed and operate very easily. The vertically moving parts of this machine weigh approximately five tons, so it is necessary for it to be perfectly counterbalanced in order to make it feed and operate easily.

The entire moving column and apron combined weigh ten tons. In order to make this move and actuate easily, an auxiliary track and carriage are placed within the bed, the carriage being supplied with eight springs which carry two tons when under full pressure. Engaging these springs are eight set screws which pass through the lower portion of the column and a suitable steel track within the bed, on which the truck is made to move with the column. By this means any given amount of weight may be placed upon the truck, relieving the sliding bearings of great strain. This truck is fitted with roller bearings so that the load can be moved very easily. This makes it possible for the operator to move this portion of the machine for purpose of adjustment, in the course of operation, with a crank of twelve inches throw.

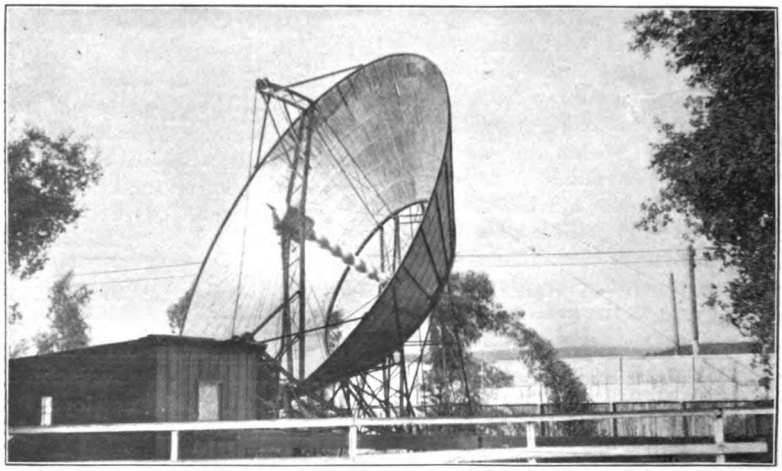
The shaper is to be employed by the Allis-Chalmers Co. in their new plant at West Allis, outside of Milwaukee, and will be used in connection with a large ground floor plate on which the heavy pieces of castings made by the company may be leveled, and the machine is to be used as a portable machine, being moved from place to place on this large floor plate. The size of this floor plate, which is one of the largest in the world, is 250

feet long by 25 feet wide. It is provided with slots for the purpose of bolting and securing the work, as well as making the attachments of the machine. The large castings are leveled up on this floor plate and then this new shaper will be moved from place to place, accomplishing its work on different portions of of the piece. Other portable tools will also be employed at the same time, in many cases three and four machines being in operation at once on a large casting.

The castings referred to, which will be machined in this manner, weigh from ten to one hundred tons each. A great saving is effected over the ordinary methods in tooling this work in the item of power, as ordinarily these immense heavy castings would have to be machined on large planers, by which the entire casting is moved back and forth during the planing operations, while with the portable machine, only the light running mechanism of the machine is required to operate. Another item of saving is the fact that several portable machines may be employed at the same time upon a large piece of work.

That Solar Motor.

IN the February number of SHOP TALK there was an article on the solar machine in operation at an ostrich farm in South Pasedena, California, and we are enabled this month to show a photograph of this interesting motor, through the courtesy of Mr. Ray S. Huey. The resemblance to a huge umbrella is quite striking, with the boiler in the center taking the place of the somewhat sawed-off stick. The rings of light reflected from the 1,788 mirrors upon the boiler are quite plainly discernable. All day, every day, from an hour after sunrise to half an hour before sunset this automatic servant turns its face towards the bright California sun and quenches the parched thirst of the dry soil with cooling streams of water.



ONE VIEW OF THE BIG MOTOR.

It is thought probable that solar motors will sometime be as common on all arid plains and scorched deserts as windmills are in Holland to-day. Under the desert sand there are often great water reservoirs which only need tapping to enable the desert to be converted into fertile pasture-land. In California and Arizona alone there are millions of acres awaiting such redemption.

Milling Machines and How to Use Them.

Chapter III—In the Jobbing Shop.

THE jobbing shop is generally considered to be a place worthy of little notice, and to the casual observer appears to be only an accumulation of dirt and antiquated scrap. It requires a little familiarity with the varying character of the problems presented for solution to see that it is a school of difficulties well calculated to train the mind that directs it, into a universal, combination affair capable of adjusting itself to any job that comes. The 16" lathe must be arranged to do duty as a 48" on saw mill repairs in the morning, and shrink to the jeweler's job on an inventor's model in the afternoon. That same night the services of the whole force may be required in order that some factory may be able to sound the whistle at the usual hour on the following morning.

The task of the jobber is not to develop special tools for turning the work out in quantities, but rather to finish odd pieces without being obliged to resort to special tools where the character of the work will not bear the extra expense. This points clearly to the wisdom of making a careful selection in tools when first fitting up the shop. The machine capable of doing only one thing, however well and rapidly it may be able to do that thing, is not the machine for the jobbing shop.

No machine is better adapted for this class of work than the modern milling machine, possessing wide range in order to take in large or small work, and at the same time possessing sufficient strength and compactness to enable it to turn out a large number of pieces rapidly when occasion requires. Automatic feeds in all directions add greatly to its convenience and make it possible to do many pieces of work that otherwise could not be done at all.

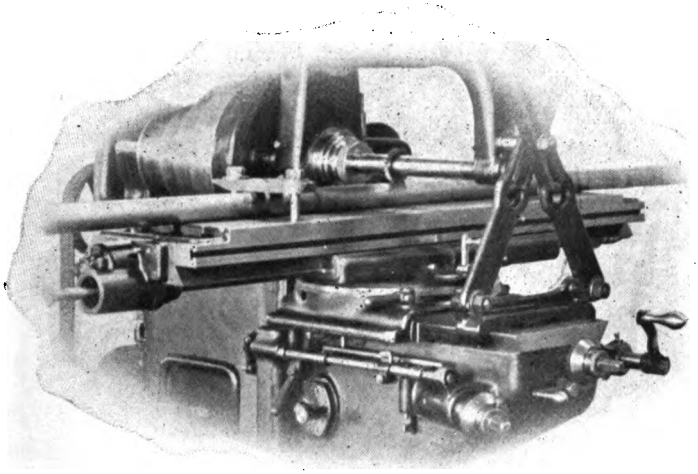


FIG. 1. KEYSEATING ON A MILWAUKEE MILLING MACHINE, SHOWING THE TABLE OPERATED FROM THE FRONT OF THE MACHINE.

The illustrations are intended to show a few of the infinite variety of combinations that can be made, and were taken

from examples of work actually done in sho s of this character. Figure 1 illustrates the most common of all jobs, keyseating a shaft, on a Milwaukee Milling Machine. These machines were designed with special reference to this class of work, or for any long work that would extend over each end of the table, making it impossible to operate the table from the end. Here the hand wheel used was removed, and the table operated by means of the crank shown at the front of the knee. It will be seen that this feature is quite important, as it enables the operator to stand either directly in front of the machine or at either end of the table, as occasion may require.

Gear cutting comes in, both large and small, and it is important that the dividing wheel in the universal head should be very large in proportion to the swing, in order to reduce all inaccuracy as far as possible. Dividing wheels that are placed inside of the head are of necessity very small, generally about one-fourth of the swing. Any inaccuracy or looseness is greatly multiplied when attempting to do large work. Figure 2 illustrates the way in which the gear can be cut that is too large for the swing of the centers. The dividing head was turned up with the spindle in a vertical position and the gear mounted in an arbor fitting in the taper hole in the

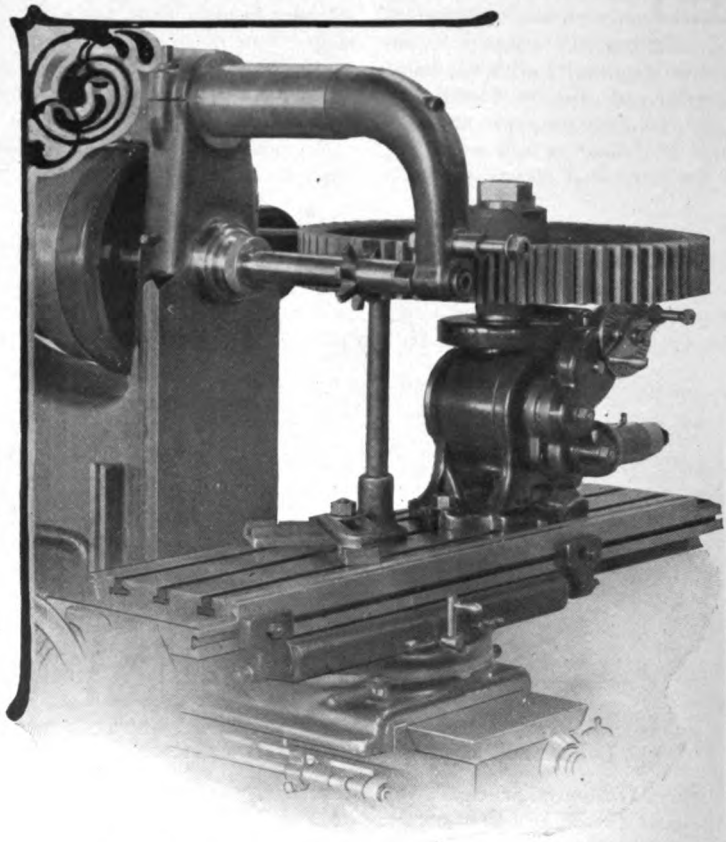


FIG. 2. MILLING A LARGE GEAR, USING THE VERTICAL FEED.

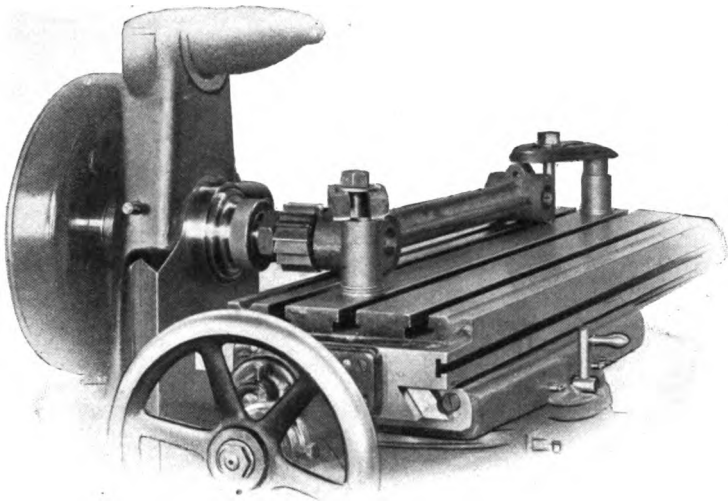


FIG. 3. FINISHING A CONNECTION ROD—FIRST OPERATION.

spindle. The speed lathe tool-rest was used to carry an adjustable bar that supported the gear directly back of the tooth being cut. The automatic vertical feed was used, feeding upward. Certainly this method would not be preferred to a large automatic gear cutter were one at hand, but it is sometimes necessary to do

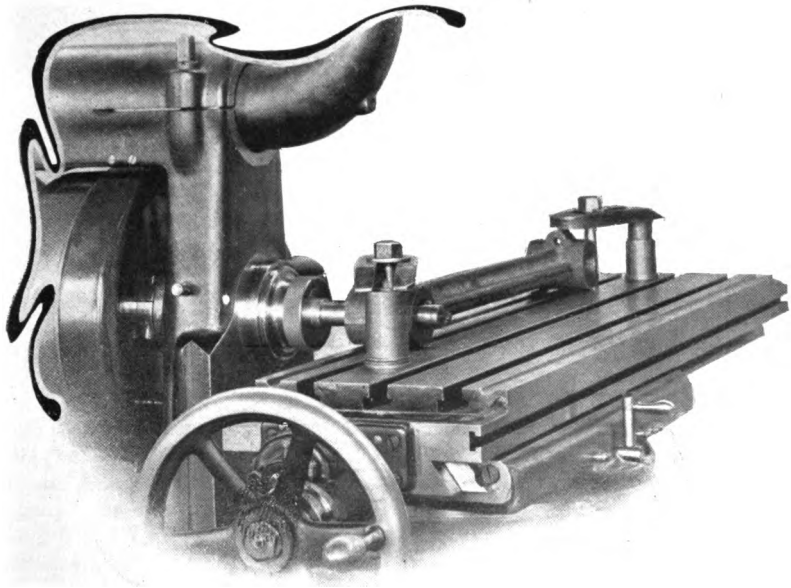


FIG. 4.—BORING—SECOND OPERATION.

all the work possible at home, and this is one of the cases where care was taken and good results produced.

Figures 3, 4, 5 and 6 illustrate a series of operations on a connecting rod for a wood-working machine. There were six of these pieces to make, and the hubs had to be faced true, and the holes bored true and parallel 24" centers. The rods were first strapped to the table with the edge the vertical spindle as was used for the first operation to face off the bosses. The ends of the rods were sure to be all of the same length and perfectly true.

Figure 6 shows how the pieces were held in the vise, and were sawed in order that the bushing might be clamped and wear taken up when necessary. All the work on these pieces was done in the milling machine without special cutters.

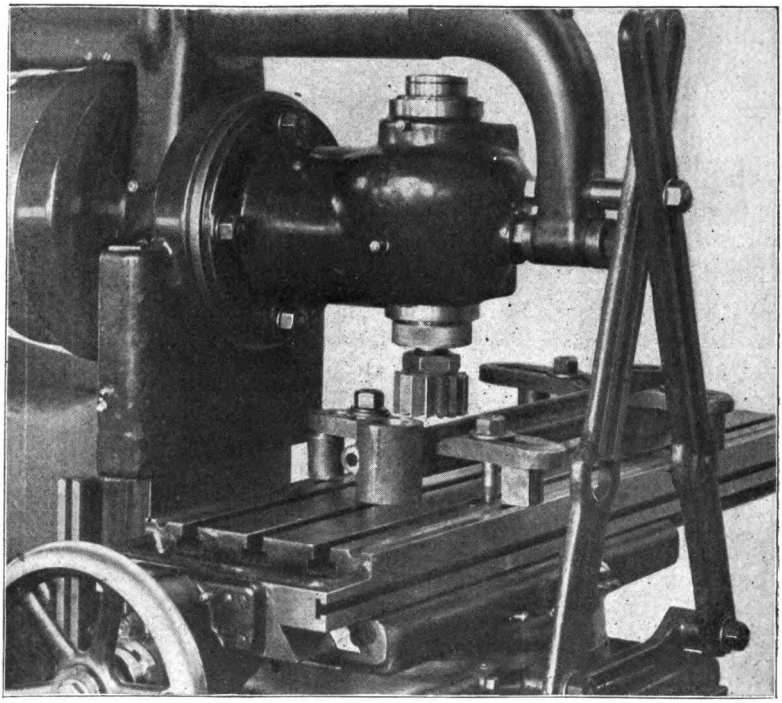


FIG. 5. FACING THE OTHER SIDE—THIRD OPERATION.

slightly overhanging, and faced with a shell end mill held on the arbor fitting in a horizontal spindle. The next operation, Figure 4, was boring the holes, which was done without unclamping the piece; the automatic cross feed being used. It will be seen that the machine in this case acts as a horizontal boring mill and that the holes must necessarily be parallel and square with the face. Next the pieces were strapped down on the face first milled, and the same end cutter used in The accuracy of the results will never be questioned and the time consumed was a minimum.

Die making is one of the jobs that frequently finds its way into the jobbing shop, and no machine is more convenient for handling this work than a good milling machine. Figures 7 and 8 illustrate two operations on a cutting die and shows the advantage of a strong vertical spindle attachment that can be set at any angle, a feature not possessed by vertical spindle

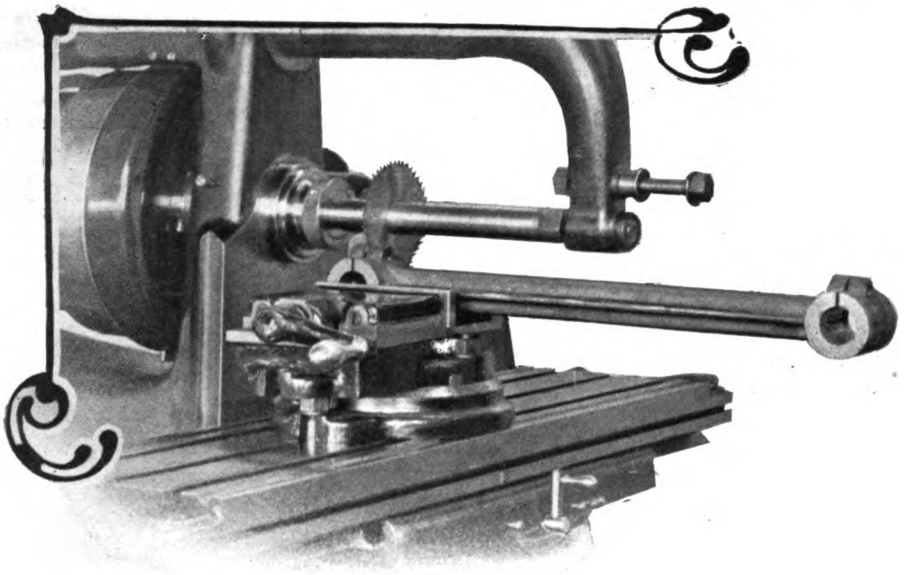


FIG. 6. FOURTH OPERATION—SAWING.

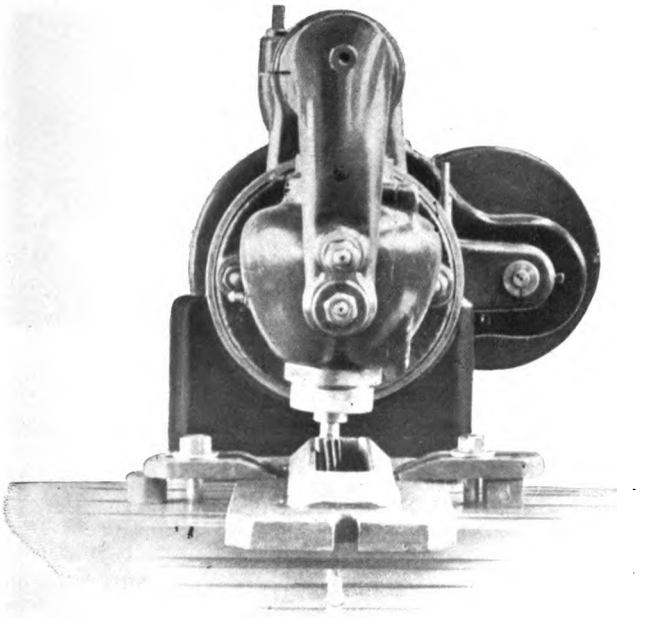


FIG. 7. CLEARANCE MILLING ON A DIE.

machines generally. Figure 8 shows the head set at an angle of 45 degrees and removing the surplus stock around the outside of the die, in order that only a narrow margin will remain for grinding. It is obvious that if the head had not been adjustable and of sufficient strength to carry a heavy cutter, this job could not be done except by blocking up the piece at the proper angle and taking several light cuts.

The head was set at an angle of 2½ degrees in Figure 7, and the proper clearance was milled off by a small standard spiral end mill. This is a method frequently used in milling draft on metal patterns.

Job work certainly offers a most excellent field for developing one's ingenuity, and it may readily be seen from these few operations just described, what an enormous variety a good milling machine is capable of doing, as well as what an advantage it is to have the best type of machine.

These operations were all performed upon a Milwaukee Universal Milling Machine.

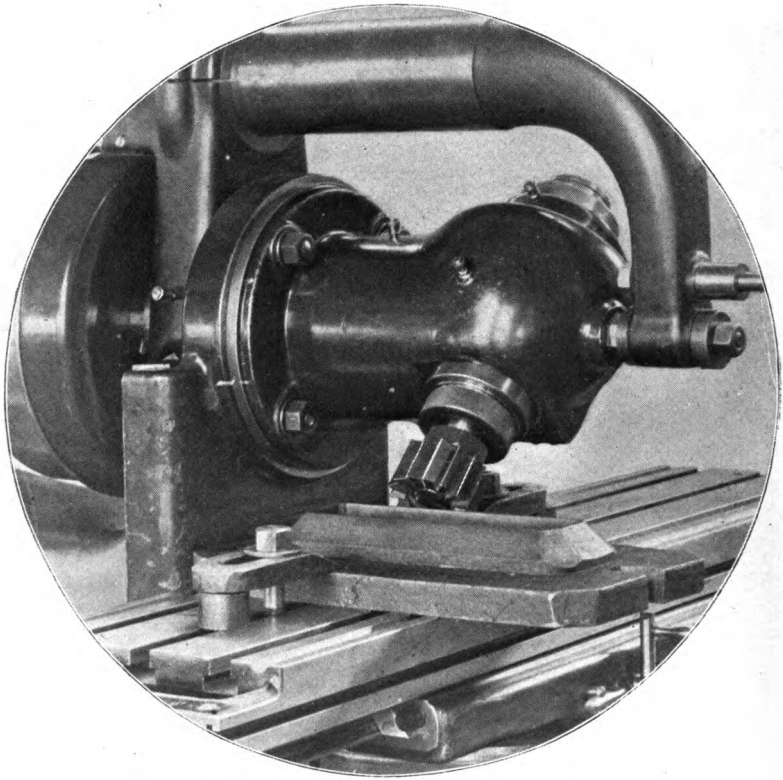
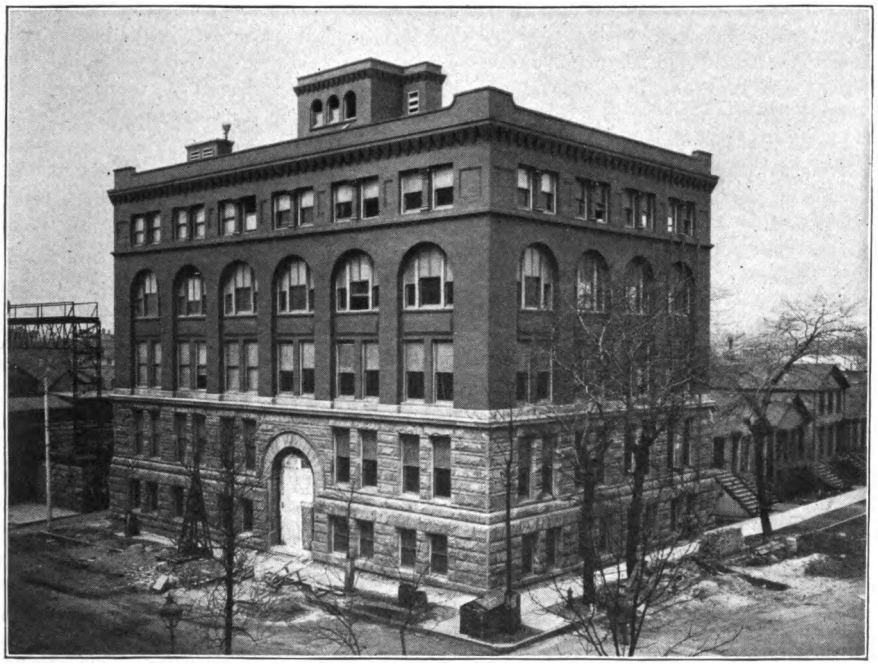


FIG 8. REMOVING SURPLUS STOCK FROM A DIE.

Does it occur to you that you want a Milwaukee Miller in your shop? You now have a small idea of what it will do, but you don't know how much more it is capable of doing till you put one to work. There is no other milling machine that will do so many kinds of work, and so well, as the "Milwaukee." We will be glad to furnish you with some names of pleased purchasers if you wish.—EDITOR.

The New Shop Building at the Armour Institute of Technology.

FOR several years the accommodations in the shops of the Armour Institute of Technology have been insufficient to meet the increasing demands put upon them because of the large increase in the student enrollment, but now, thanks to the fine new Machinery Hall, there will be plenty of room and ample accommodations for a large body of students.



MACHINERY HALL.

The new shop building is four stories in height, built of brick and stone to conform with the general appearance of the main building. The roof is of the modern approved saw-tooth type, providing ample and well distributed light for the top floor.

floor has a different shop; the first floor being devoted to the forging and blacksmith shop, the second to the machine shop, the third to the pattern shop, and the fourth to the foundry. The basement will be used for the storage of all sorts of material. The disposition of the various floors is rather unusual, but in conformity with good practice. The heavy hammers of the forge shop require a very solid foundation, and for that reason were placed on the ground floor, while in order to carry off the fumes and gases from the foundry without inconviencing the other departments, this latter was placed at the top of the building.

One feature in particular in the arrangement of this building deserves special attention, and that is, the demonstration lecture rooms upon each floor, which are to be used in conjunction with

the actual shop-work. A corner in each floor is partitioned off into a class room with a seating capacity of forty students, and by the instructor's desk are the types of machines which will be used to demonstrate before the whole class how the work of that particular sort of shop is done. The demonstration class room adjoining the forge shop contains a down-draft forge in operation and an anvil; the machine shop an engine lathe and a bench tool grinder; the pattern shop a a 5-foot pattern maker's lathe and pattern maker's bench with all necessary tools; the foundry, a bench and the usual flasks and equipment. There is also a stereopticon in each room. Thus it may be seen that the work of instruction and the actual practice will be in close conjunction, going hand-in-hand, and that each will be impressed upon the student to the best advantage and with the least loss of time in imparting knowledge. It is a feature of much merit.

Another room in the corner of each floor is devoted to the locker-rooms and lavatories. Eighty expanded metal lockers are used in each, and everything is of the most modern type. The elevator and stairways run up between these two above-mentioned corners, and next to the elevator shaft on each floor is the tool-room for the respective shops.

The equipment of the forge shop includes fifteen down-draft forges, twelve power forges and a hand forge, a 200-pound steam hammer and a power hammer, a coke furnace, a 20-inch drill press and a 16-inch double emery grinder. A jib crane is arranged to serve both hammers with the heavy work. A 20 H. P. motor drives the exhaust fan and blower, as well as a swing saw in the basement for cutting up stock. The east side of the forge shop will be devoted to steam-fitting. There are seven pipe benches with complete equipment, and a motor driven pipe-threading machine with a capacity up to six-inch pipe.

In the machine shop there are thirteen engine lathes of different sizes up to 26-inch, three speed lathes, a Brown & Sharpe universal grinder, B. & S. surface grinder, B. & S. cutter and reamer grinder and a Diamond grinder. The equipment of drill presses is complete, and there are also three milling machines, a screw machine, a 30-inch planer, two shapers, a horizontal boring machine, a twist drill grinder and a lathe center grinder. There is a gas furnace for brazing and tempering, and a large Gisholt lathe is to be added next year. Around the shop are thirty bench vises with full set of machinists' tools. The tool room includes all the tools necessary for working in iron, steel or brass.

The wood-working and pattern-making shop is equipped with thirty-three 12-inch wood lathes, an 8-inch pattern lathe, four 6-inch pattern lathes, a circular saw, two band saws, a 26-inch surfacer, vertical boring machine, a three-side 4-inch molder, scroll saw and a gluing bench complete. There are forty benches with vises, with a complete set of hand tools for each bench.

In the foundry is a Whiting cupola with a capacity of one ton per hour, a set of forced draft brass furnaces and a portable core oven. The cupola has a direct connected motor blower. Three one-ton cranes run down the shop with a 5-inch air hoist on each. There is a motor driven air compressor for running the hoists, tools and the molding machines, of which there are three, as well as a pneumatic sand-sifter. The shop is divided into floor molding and snap-flask molding, for which there is the usual set of flasks, etc. A dry cast iron tumbler, a brass tumbler and an emery wheel complete the equipment. Some pneumatic chipping hammers will be added later on. A system of tracks is arranged to take the metal on trucks from the cupola and furnaces and distribute it to various parts of the floor. One crane also runs up to the cupola. The elevator is arranged to run up higher than the top floor, so as to

charge the cupola. This little addition to the roof may be noticed in the illustration.

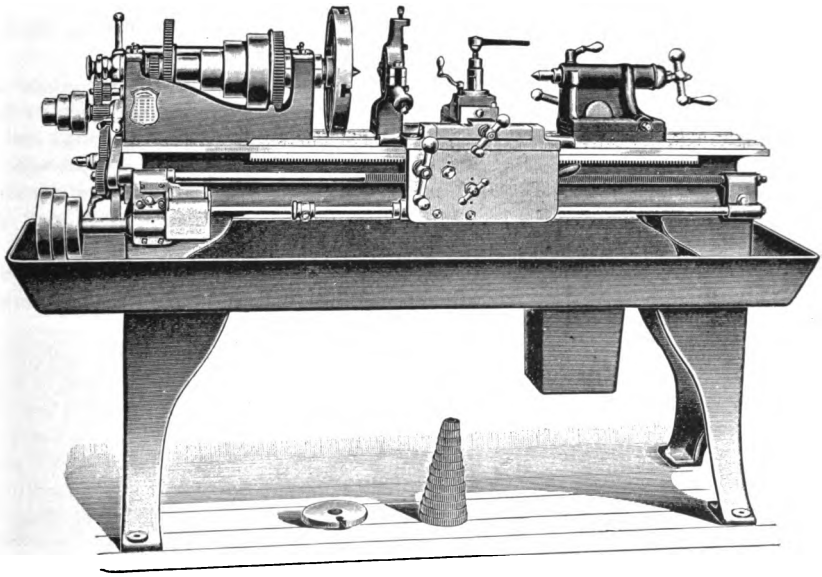
The general lighting throughout the building is by enclosed arc lamps, and incandescent drop lights are used together with these. The forced draft system of heating and ventilating is used throughout, the blower engine for this being located in the basement. This is the only engine used in the building; all the other power being derived from electric motors. There is an abundance of light in all the floors during the daytime, and the whole building is generally attractive, inside and out. It will, no doubt, be a happy day for faculty and students alike when they are installed and running in their new Machinery Hall. M. W. L.

The Blaisdell Pan Lathe.

THIS cut illustrates a 13-inch Blaisdell lathe with short legs set in the pan and securely bolted to it. This is intended for a tool room lathe, or where it is particularly desired to catch all chips, oil, etc., which would otherwise fall to the floor. A pan of this style can be put on a lathe of 4, 5 or 6 foot bed, with rise and fall rest, plain gib, compound rest or either style of back taper.

This lathe has all the regular attachments usually put on a Blaisdell lathe, and is as accurately made as any large or small lathe on the market. It has a lever binder for the tailstock, and running gears on the feed rod for fine feed. The tailstock is the Blaisdell cut away pattern.

The suspended pan lathe is another of the Blaisdell makes, and can be attached to almost any size. In their own shop they employ two of the 17 inch and one 18 inch lathes with the suspended pan.



THE 13-INCH LATHE WITH PAN.

These are but two types of the large variety of excellent machines turned out from the Blaisdell factory. They manufacture a large line of engine lathes and drill presses also, all noted for their reliability.

On View at Our New York Store.

AT our new location in the Liberty Building in New York there are on exhibition a number of our representative machines. These include the Bath Grinder, Milwaukee Milling Machine Precision Boring Machine, Flather New Model Lathe, No. 2 Improved Lincoln Milling Machine, Bardons & Oliver Screw Machine, a line of Friction Drills, the Chicago Grinder and the Chicago Countershaft. Everyone who is interested in machine tools is cordially invited to call at the store and inspect these machines. Always glad to see visitors you know. Remember, the address is

123 Liberty Street, with the **Office entrance at 153 Greenwich Street.**

A Wonderful Iron Mountain.

THERE is, in Styria, a justly renowned source of iron ore, called the Erzberg, or Ore Mountain, situated between Vordernberg and Eisenerz. This mountain consists of a bedded mass of spathic iron ore, which rests below on schists, believed to be of Devonian age.

The mountain itself is conical, with a rounded summit, and reaches a height of nearly 4,800 feet above the sea level, and about 3,000 feet above the small town of Eisenerz. It is surrounded by lofty mountains, most of which exceed 6,000 feet in height, and presents a very imposing and picturesque appearance. Iron ore has been quarried from the mountain from the very earliest antiquity, for it is believed that the "Noric Iron" of Tacitus, Ovid and Horace, was made from the ore quarried on the face of the Erzberg, or its immediate neighborhood. Erzberg belonged to the Roman province of Noricum, and the ore is known to have been quarried by the Romans. The works have been in operation ever since, and the mountains appear to be still full of inexhaustible treasure.

Unfortunately, a fire which occurred in Eisenerz in 1618 destroyed valuable documents, carrying back the history of the manufacture to A. D. 712; the records now in existence only go back to the twelfth century, which, early as it is, must still be regarded as late in the history of Erzberg.

The lowest ores on the mountain are somewhat more silicious, and so less valuable, while those higher up are of special purity. Usually the ore is basic in character, and contains in the raw state upwards of 40 per cent of iron, 2 per cent of manganese, about 3 per cent of magnesia, and a little lime. The quantity of sulphur and phosphorus is extremely small.

The ore, after being brought from the quarries, or mines, is calcined in kilns with the waste heat from the blast furnace. Much of the carbon dioxide is thus eliminated, and the iron is almost entirely oxidized to the ferric condition. It is then smelted in small blast furnaces, the fuel used being entirely charcoal.

It is from this ore that the wonderful Styrian Steel is made.

Some Good Special Work.

THE most complicated piece that has as yet been held in the Extra Capacity Automatic Chuck of a Bardons & Oliver turret lathe, is a pneumatic hammer handle shown here in the second illustration.

The extra capacity spindle end of the Bardons & Oliver turret lathes was designed specially for a class of work too large for standard collets, and which was formerly held in a lathe chuck, necessitating stopping the machine to chuck each piece of work, with a corresponding loss of time. This spindle end effects a

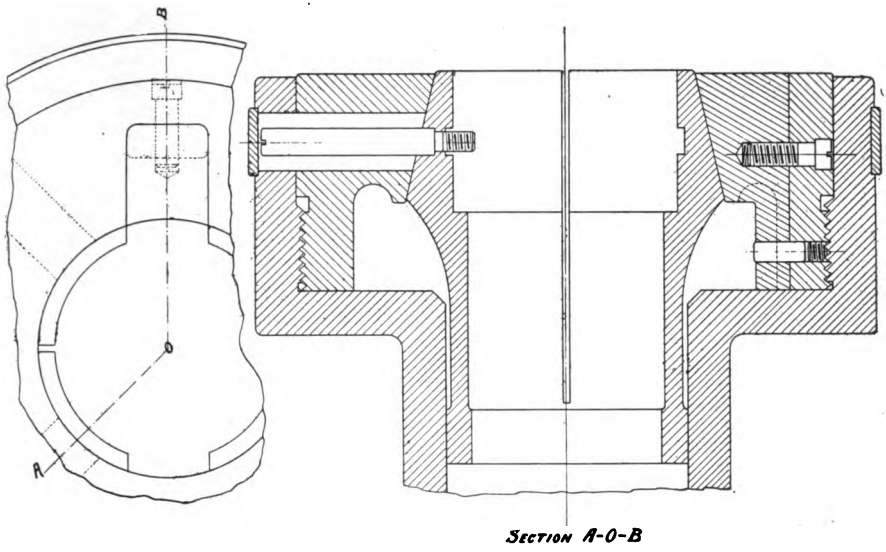


FIG 1. DETAILS OF THE SPECIAL AUTOMATIC CHUCK.

great saving in time in chucking, and also, owing to the slight overhang, there is less tendency for the tools to chatter. The work that can be held is not limited, as may be seen, to circular pieces, but squares, hexagons and many irregular shapes, such as those here shown, can be held by the employment of suitable false jaws in the automatic chuck.

The collet used for holding this pneumatic hammer handle is the No. 12 Master Collet with openings on both sides to allow the handle to pass. There are also corresponding openings in the collet ring. These openings in the collet do not interfere with its use for regular

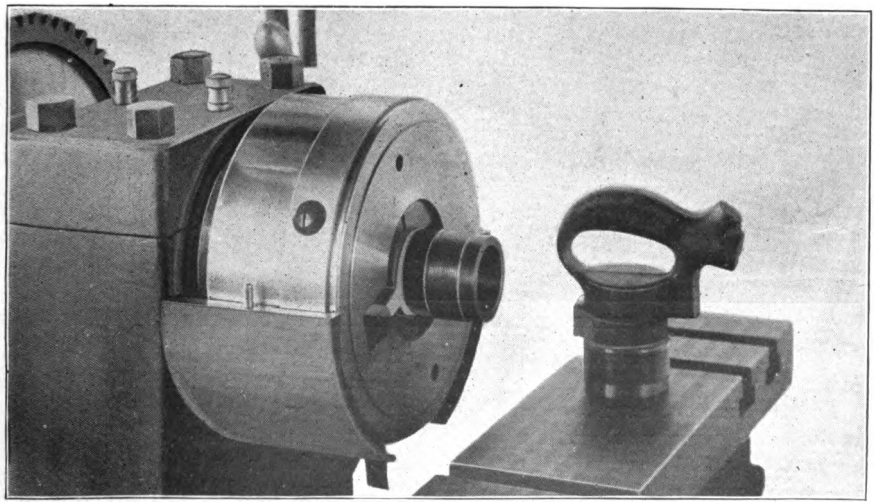


FIG. 2. SHOWING THE HANDLE IN THE CHUCK, AND ITS IRREGULAR SHAPE.

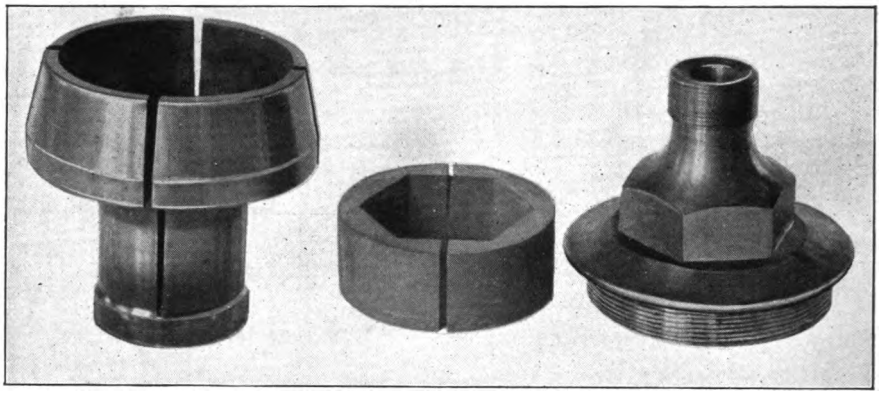


FIG. 3. MASTER COLLET, FALSE JAWS AND VALVE BONNET TO BE HELD.

work, a filler being provided for the opening in the collet ring. The false jaws may be changed without removing the collet, and the ring around the head of the spindle slides so as to cover the screw holes when the machine is not in use.

The first illustration shows more fully the construction of this special automatic chuck.

Another excellent example of work held in the extra capacity automatic chuck is shown in Fig. 3. The piece to be held is the valve bonnet at the right of the figure. At the left is the extra capacity master collet, and in the center the set of hexagon false jaws which adapt the collet to holding the work. The last illustration shows the valve bonnet in the machine with the outer end finished.

It may thus be seen that turret machines are adaptable for almost any piece of work, by the application of skill and ingenuity. The manufacturers of these machines are certainly endowed with a large portion of each of these qualities, and can design and fit false jaws for irregular work of almost every description.

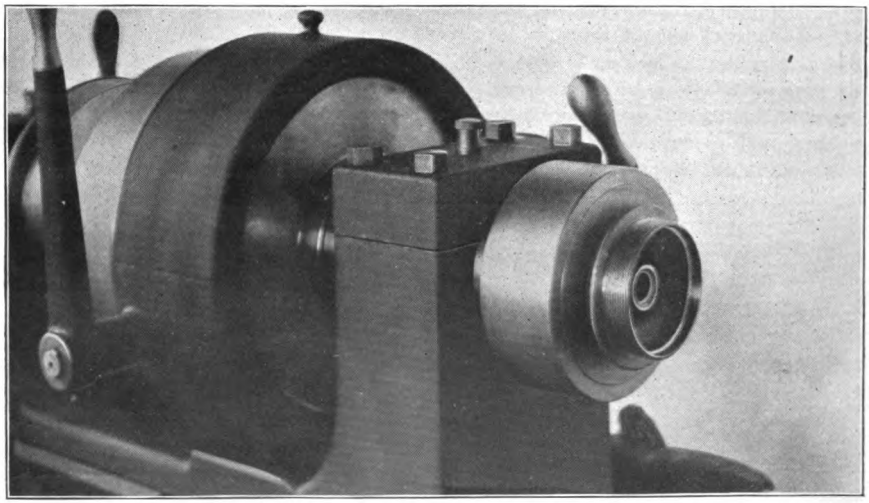


FIG. 4. SHOWING THE VALVE BONNET IN THE CHUCK.

EDITORIAL SHOP TALK

IN the multitude of advice showered upon the American public today by the "captains of industry," and successful men generally, this one feature of it all is ever prominent – namely the necessity for hard work. The young man is advised pro and con as regards college education, habits, and many other things, but all agree that whatever else may be essential or non-essential, continuous hard work, and lots of it, is an element without which no one can attain that eminence in the eyes of the world for which so many strive.

The second convention of the Associated Publishers of Commercial Periodicals was held at the Auditorium Hotel, April 21st and 22nd. The prime object of this Association is to obtain for meritorious periodicals, such as SHOP TALK, a Post Office classification which will enable them to be mailed in bulk at a pound rate instead of being obliged to stamp each one separately and pay by the ounce or fraction thereof.

It is sincerely hoped that they will be successful in this movement, and they no doubt ultimately will, for this classification would not only be more equitable for the publisher, but would materially benefit the Post Office department as well, greatly increasing their revenue and making an enormous decrease in the labor of handling.

This month's article on job-work, by Mr. E. J. Kearney, cannot help but be of benefit to a large number of men who use, or in any way come in contact with a milling machine. We are truly indebted to Mr. Kearney for the lucid and interesting manner in which he sets forth the capabilities of that perfect development of machine tool.

Original articles on job-work, new or better methods of accomplishing results in the shop or factory, in fact just the things you like to read about, are always welcomed by the EDITOR, and if acceptable will be paid for at regular space rates Don't think you can't write about it! Just tell us how you did that last tough job of yours as if you were right here. Address the EDITOR of SHOP TALK.

We hope our readers will enjoy this number of SHOP TALK. It is a good one. Our constant endeavor is to make SHOP TALK interesting and valuable both to the mechanic, or machinery maker; the machinery seller, and the machinery buyer. We hope we are successful in doing so.

Back numbers should be carefully preserved and kept for reference. SHOP TALK is too good just to look through once and throw away. It isn't too bulky either, but just the handy size.

We are always glad to hear of people with a half-dollar they wish to invest profitably. The best thing to do with it—now this is confidential—is to buy SHOP TALK at par for one year.

If you will read over our advertising pages you will no doubt find something you have been looking for. There are a number of opportunities offered there, both by us and by other firms as well. These deserve your attention. And when you write or order please remember you saw it in SHOP TALK and say so.

A Gas Engine "Kink,"

BY ALBERT STRITMATTER.

IN many machine shops, and the number of them is increasing every day, a gas or a gasoline engine is used for the prime mover. Usually it is the duty of some one of the "hands" to take care of the engine, start and stop it, etc., in connection with his other work. Now this "hand" may be a very excellent machinist who has worked in a steam engine factory and knows the "ins and outs" of steam engine practice, and it may have been for this very reason that he has been selected to take care of the gas engine. But unless he knows something about the method of operation of the gas engine in general (and it is considerably different from a steam engine), let him look out or he'll get into trouble.

Perhaps some morning he goes to the engine as usual, turns the crank to the back center, puts the priming charge of gasoline into the cock cup, opens the cock, turns the fly wheels forward to draw in the charge, pulls back on the compression and then gives the engine a spark, but instead of exploding the charge and starting off as any self-respecting gas engine ought to do, it stops. This "rattles" the operator a little and he goes through the process again, with the same result. Perhaps he tries half a dozen times and by that time the other men are coming up to see why the machinery has not started. All venture opinions as to the cause of the trouble, until perhaps half the morning is spent without being able to start, and the engineer and the foreman have ruined their chances of ever reaching the place where all good machinists expect to go when they die.

This is not an unusual event in shops where a gas engine has just been installed and is being handled by some one who has not had previous knowledge of or experience with such engines. And yet the solution is easy when the cause of the difficulty is understood.

We all know that in order to explode or ignite the priming charge of gasoline there must be oxygen or air mixed with it. We also know that if we had a room full of air and then mixed with the air a very small amount of gasoline vapor, the mixture would not ignite. In other words the proportion of gasoline to air is too small and the result is that the mixture is weak. Suppose, now, that the amount of gasoline is increased gradually. After a while we would have enough gasoline to make a mixture which would burn. If we continued to increase the amount of gasoline, the force of the ignition would increase and we would have an explosion, the intensity or force of which would increase as we increased the amount of gasoline, until a certain proportion was reached. At this point say one volume of gasoline gas to 7 volumes of air, the explosion would be the greatest. After this if the amount of gasoline was increased, the force of the explosion would again decrease because there would not be enough air to permit of perfect combustion. In other words, the mixture would be too rich with gasoline, and if we continued increasing the gasoline and decreasing the volume of air we would finally reach a point where the mixture would not ignite, as there would not be enough air to support combustion.

This is exactly what may take place in the gas engine cylinder. The operator learns by experience that about so much gasoline should be used for the priming charge, as this amount forms an explosive charge with the air which is drawn into the cylinder with the gasoline. Suppose that the operator, when attempting to start some morning, absent-mindedly uses too little gasoline for the priming charge. The result is that the cylinder contains a mixture too poor in gasoline

to explode. Or, suppose that the operator uses too large a priming charge. The mixture is then too rich to ignite. To make matters worse, the operator probably puts in another priming charge right away and attempts to start again. If the first mixture has been too weak this may result in producing a properly proportioned charge, but more than likely it will be too rich. If, however the first charge was too rich, the addition of others simply increases the amount of gasoline and makes it absolutely impossible to ignite it. If, then, the operator fails to start the engine on the first attempt, he should open the cocks and valves and turn the engine over idle a couple of times to blow out the first charge, and then start anew. By so doing he will avoid getting the cylinder flooded with gasoline.

But perhaps the operator may think that as the charge he uses will ignite if he puts a lighted match to it, that it certainly ought to be explosive in the cylinder. There are several reasons why this is not the case, one of the most important of which is as follows. As the priming charge is drawn into the cylinder a certain portion of it is vaporized or remains mixed with the air as a finely divided spray, while the remainder retains its liquid form and falls to the bottom of the cylinder. Now most igniters, whether of the hot tube or electric type, are located in the center of the cylinder head or on top of the engine, so that while there might be enough gasoline in the bottom of the cylinder to ignite there must be enough in vapor or spray form to make an explosive mixture at the igniting mechanism. Again, a mixture which would explode on the application of a lighted match might not do so from the comparatively small spark of an electric igniter, or from the hot tube which may not be at the proper temperature.

This is only one of the points in which a gas or gasoline engine differs from a steam engine, and no matter how thoroughly a man may be acquainted with steam engines, if he attempts to handle a gas engine thinking it is just the same as a steam engine, it will not be very long until he is "up against" something.

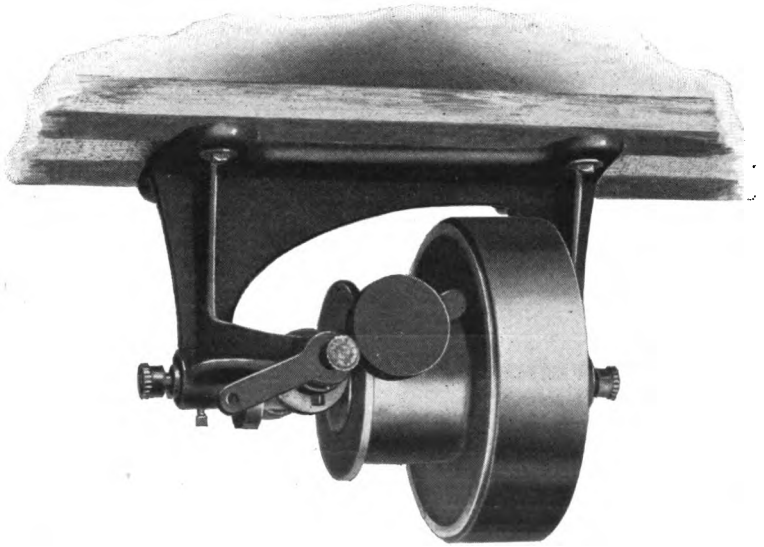
Friede Observation Globe at the St. Louis Fair.

THE FRIEDE aerial globe, which will be to the word's fair at St. Louis what the Ferris wheel was to Chicago and the Eiffel tower to Paris, will be the largest structure in the world and will remain a permanent attraction in St. Louis after the close of the exposition in 1903. It is to be a great observation globe of steel, which will tower 700 feet above the ground, with observation towers 100 feet higher. Hanging or suspended gardens, high up in the air, cafes, music halls, palm gardens and various other devices for social amusement will be provided for. A great coliseum for conventions will be part of the structure. From the top of this giant steel building, to be reached by sixteen rapid elevators, the city, the great sweep of the Mississippi and the surrounding romantic rural scenery can be seen for thirty miles around. The company organized to exploit Architect Friede's idea consists of some of the wealthiest men in St. Louis, and the globe will cost when finished in the neighborhood of $2,000,000. An idea of the immense proportions may be gathered from the fact that it will dwarf St. Peter's at Rome, the great pyramid of Cheops and other giant structures which have been wonders of the world for their size. The great convention hall will be 314 feet above ground, a few feet higher than the dome of the capitol at Washington. The music hall and cafe will be 390 feet up in the air, and the palm garden 440 feet. A theater will be run at a height of 110 feet, while 700 feet above the base will be a memorial room.

The "Chicago" Pull Countershaft.

IN conjunction with our new "Chicago" grinder we have just brought out an entirely new pull countershaft, which has many admirable features. Pull to start, pull to stop—it's all the same. No lever to push this way or that, nor handle to twist your wrist, but just a rope to pull and the deed is done. Handy? Well, we should say so!

Designed and built with the true reliability and excellence of all Hill, Clarke & Company's tools, this is certainly a mighty handy mechanism.



The illustration shows the essential elements of construction. The lever with the weight is set just eccentric enough to throw on the friction clutch, and the weight holds it firmly in place. The contact roller is made amply large, so that its speed is comparatively slow, and it does not run when the clutch is out. The shaft is stationary in the hanger, and the pulleys revolve upon it, making a very long bearing. The shaft is drilled in longitudinally from both ends, and grooved to distribute the oil. Grease cups at each end supply ample and reliable lubrication, thus dispensing with all annoying oil cups and the accompanying dirty drip cups. The roller also revolves on its shaft and is lubricated in like manner.

The utmost simplicity is employed throughout, making this countershaft very small and compact.

The throw-over lever must be at the back of the countershaft to clear the belt, so a pivot is provided on both sides to accommodate it to the direction of the driving belt.

The countershaft is very positive in action, and is so simple that it cannot get out of order. It is of light weight, and takes up very little room. Being all in one piece, there is no lining up to be done – just bolt it in place and it is ready. This is a feature to be appreciated in setting up. No shifting, squeaky belt when it is thrown in, but just simple grip and go.

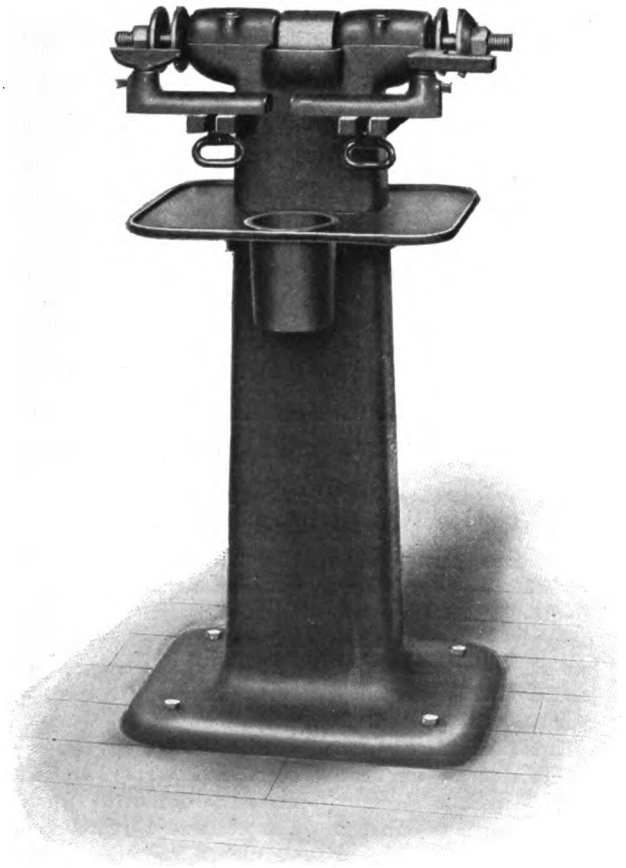
For simplicity and all-around reliability this countershaft is unexcelled.

Pull it! "It's a bird."

The New "Chicago" Grinder.

N presenting our new Chicago Grinder, we do so with the confident assurance that it is the best machine for its purpose as yet put on the market by any manufacturer. There are many other grinders, it is true, but none combine all the desirable features of the "Chicago;" it has more advantages than others, with none of their bad points. This is not said in disparagement of the many other excellent makes, but simply to emphasize the pre-eminent quality and superiority of the "Chicago" grinder.

First of all, the column and head are cast solid in one piece, which insures absolute rigidity. This construction is one of the leading features of our grinder and gives to it that solidity and compactness which is so desirable in a grinding machine. Another element of rigidity is a web cast with the column which connects the bearings on either side, curving out enough to clear the belt where it passes over the driving pulley.



THE 12-INCH CHICAGO GRINDER.

Not only do these points afford desira-

ble rigid qualities to the machine, but also give to it a pleasing outline and a graceful appearance, instead of rough, hard joints.

An absolutely dust-proof bearing is embodied in the Chicago grinder. No dust, dirt nor emery can possibly find their way to the bearings, either in running or in the act of oiling, and anyone with the slightest experience in using a grinding machine will appreciate how essential it is that these bearings be kept clean. Oil cannot escape along the shaft to be sprinkled on the operator any more than dust can enter, on account of a small groove turned in the shaft at the ends of the bearing, but inside the boxes.

Beneath the boxes is an oil receptacle cast in the column piece, and from it rises a wick which comes through the babbit at one end of the box, lies in a little trough cut for it in the bottom of the box, and goes down again to the oil at the other end. This keeps the bearing continually oiled, and after once filling the oil receptacle, the machine will run for three months without further attention. No dirt or emery dust will mount the wick, so that even if in refilling with oil, some dirt should enter the receptacle, it will be absolutely harmless, as the wick cannot carry it to the shaft.

A pan with water pot is securely bolted to the column, but the machine may be furnished either with or without this pan at the customer's discretion. The two usual rests for work are provided, and are unusually strong.

Only genuine babbit, and nothing but babbit is used in the bearings, and everything that can be done, both in design and manufacture, has been done to make this grinder a perfect one. All best materials and workmanship are, of course, employed, and not even the detail of finish is unobserved. The machines are finished in handsome style, and are certainly, taken all in all, the very best things of their kind ever offered to the machinery public.

Notes on the Treatment of Tool Steel.*

BY F. KORB AND THOS. TURNER.

THIS subject is far from new, but really of great importance, and it is hoped that these notes may be practical and useful. For most of this matter we are indebted to the manager of Messrs. Bohler Bros. & Co.'s Styrian Steel Works, Sheffield, who has had a very large experience in the treatment of high-class tool steel.

It has frequently happened that a sample of steel has been condemned as being of inferior quality, while in many, if not in most cases, the fault lies not in the steel itself, but in the persons who have selected or used it The causes of these failures are, of course, various—sometimes the proportion of carbon is not suitable for the particular purpose; sometimes the steel is overheated in forging; but most frequently the fault lies in hardening or tempering of the steel, and this is in many cases a very delicate operation.

In order for an operator to be able to determine whether the hardening processes have been conducted in a manner suitable to the proportion of carbon which is present in a given sample of steel, it is necessary for him to be familiar with the characteristic appearance of the fracture of such a specimen when it has been properly treated. In working with steel of good quality, an operator who is thus familiar with the appearance of the different fractures can, to a great extent, guard against the use of too high a temperature, or of other injurious treat-

Extracts from a paper read before the South Staffordshire Inst. of Iron and Steel Works Managers.

ment during the hardening process. Unfortunately, however, it is impossible to describe these various appearances in such a manner as would be readily understood or practically useful. Usually the knowledge comes to be almost an instinct after long experience.

A simple experiment will, however, show the enormous alteration produced in a high carbon steel by different methods of hardening. If a forged or rolled bar of such steel be taken and nicked, either when cold or at a cherry red, at about nine or ten places, and about half an inch apart, a suitable specimen is obtained for the simple experiment proposed. Place one end of the bar in a good fire, so that the first nicked piece is heated to whiteness, while the rest of the bar, being out of the fire, is heated up less and less as the other end is approached. As soon as the first piece is at a good white heat, which of course burns a high carbon steel, and the temperature of the rest of the bar gradually passes down to a very dull red, the metal should be taken out of the fire and suddenly plunged into cold water, in which it should be left until quite cold. It should then be taken out and carefully dried. An examination with a file will, of course, show the first piece has the greatest hardness, while the last piece is the softest, the intermediate pieces gradually passing from one condition to the other. Now, in all probability, the best metal for most purposes will be found in the piece about second or third from the hot end. This then is hardened to the proper degree, and its characters should be carefully studied in connection with those of the rest of the bar. It will be found that the tenacity of the metal is less on either side of the selected piece, and gets less as we proceed further and further away from the proper point. The hardness of this piece is still very considerable, approaching that of the first piece. On now breaking off the pieces at each nick, it will be seen that very considerable and characteristic changes have been produced in the appearance of the metal. The first burnt piece is very open or crystalline in fracture, the succeeding pieces becoming closer and closer in grain, until the selected piece is found to possess that perfectly even grain and velvet-like appearance which is so much prized by experienced tool steel users. The first pieces also, which have been too much hardened, will probably be cracked; those at the other end will not be hardened through. Hence, if it be desired to make the steel hard and strong, the temperature used must be high enough to harden the metal through, but not sufficient to open the grain.

In connection with the physical properties of a good steel, there are many persons who consider a steel is of good quality if it is very hard. As a matter of fact, hardness considered alone is a very uncertain test of quality. It is evidently a truism that the best steel to use for a particular purpose is that which is best suited for the purpose in view. There is, however, no steel, no matter how good it may be, that will answer for every purpose.

In general tool steel may be called good if it hardens readily and is not very liable to crack; its tenacity should also be high, varying, of course according to the degree of hardness.

In hardening steel tools there should always be a good fire when the tool is introduced, the blast must then be lowered at once, especially with large tools, and only when the tool attains the proper temperature, depending upon the composition of the steel, should the blast be again employed. It is important that the forging heat should never be employed as hardening heat, but after forging, the tool should be allowed to cool, and then be heated up again for hardening. Tools of difficult shapes should always be annealed before the hardening process.

THE *Canadian Manufacturer* is now running their news of manufacturing enterprises, new mills, etc., under the heading of "Captains of Industry." This phrase seems to have a subtle power all its own, judging from its widespread use.

A POLICY of publishing a "Machinery Issue," the first number of every month has been adopted by the *Iron Trade Review*. The first of a series of articles on the "Evolution of the Machinery Trade" is presented in the May machinery number, and is a history of the Niles-Bement-Pond Co. Quite a space is devoted to an article on the "Cost—Keeping and Manufacturing Methods of the National Cash Register Co., Dayton, Ohio," and in addition to a number of varied articles there is one on "Workshop Records in Cards and Files." An immense amount of information is included between the two yellow covers of this journal and it is worth careful reading.

THE *Cosmopolitan* magazine begins, with the May number, a series of articles on "Captains of Industry." The editor of that magazine says by way of introduction, that "the industrial changes which have of late been occurring with such rapidity have the widest possible interest for all classes from the standpoint of the producer and from that of the consumer, and that a knowledge of these men, their derivation, their leading characteristics, weaknesses and abilities, will throw much light upon the news of the day in which their names constantly recur."

The list this month includes J. P. Morgan, Thos. A. Edison, John Wanamaker, Chas. H. Cramp, John W. Mackay, Alex. Graham Bell, James Gordon Bennett, W. R. Hearst, Joseph Pulitzer, and Albert R. Pope. It would appear from a glance at this list that the editor of the *Cosmopolitan* includes much more in his idea of what constitutes a Captain of Industry than is ordinarily accepted, especially by noting that the names of three newspaper men are in the number, a set of men who are not ordinarily placed in that classification.

Each of the sketches is written apparently by some one well enough acquainted with the "captain" to tell his good points, a thing which is undoubtedlly much better than intrusting this task to a single individual, as it gives a much more diversified presentation of the subject in general. The articles are interesting reading, and no doubt have their effect in stimulating the ambition of many, but to the average reader the gloss of unstinted praise is honey spread a bit too thick, and does not carry out the idea expressed in the introduction of presenting weaknesses as well as abilities.

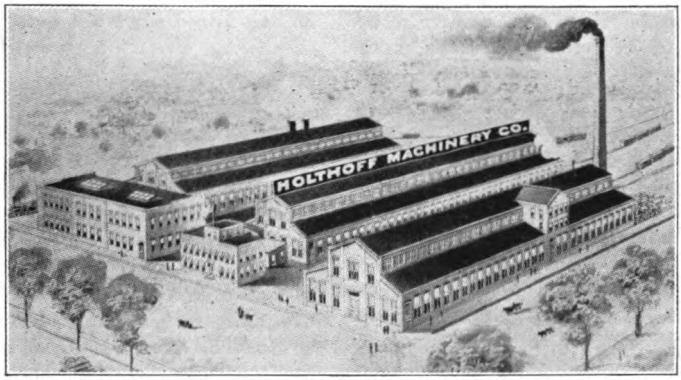
The effect, however, of this feeling is largely dispersed by reading an able article on Cecil Rhodes, in which his failings are set forth in a convincing and dispassionate manner, as well as his great abilities, by John Brisben Walker.

There is also a tribute to that great champion of eternal justice, John P. Altgeld, also by Mr. Walker, who knew him personally.

This should be read by former enemies as well as friends, for the justice as well as the beauty of it.

Another Big Milwaukee Plant

THE Holthoff Machinery Company, recently organized in Milwaukee, Wis., for the manufacture of mining and metallurgical machinery, has its new plant about ready for operation. The works are located at Cudahy, one of the promising suburbs of Milwaukee, on the Chicago & Northwestern railway, and accessible also by the cars of the Milwaukee Electric Street Railway Company.



The officers are W. D. Gray, president; H. C. Holthoff, vice-president, and B. T. Leuzarder, secretary and treasurer, all of whom are well-known to the public by reason of their long association with the E. P. Allis Company, and who resigned shortly after the company was taken over by the Allis-Chalmers Company.

The new works, as illustrated herewith, consist of a boiler and sheet metal shop 250x100 feet, which is one of the best boiler shops in the country; a machine shop 250x110 feet, a pattern shop 120x60 feet, with a two-story office building 80x32 feet. Provision is also made for a foundry 250x100 feet, which will be erected in a very short time. The other buildings are nearly completed and the company is now occupying its new offices.

The shops are equipped with the best and most modern type of machinery, some of the fine machine tools in the machine shop being a 50" x 24' Johnson triple geared lathe, a 38" x 48" x 14' Gray spiral geared planer, a Morton key-seater, a Flather back-geared 24" shaper, and a "Milwaukee" universal milling machine.

It is the purpose of the company to manufacture a full line of mining and metallurgical machinery, including stamp mills, chlorination mills, cyanide mills, concentrating mills, silver, lead and copper furnaces, converters, smelters, copper bessemerizing plants, transmission machinery and mine equipment, together with boilers and all kinds of heavy sheet metal work. With the long experience which these gentlemen have had in this line of business, and with a new plant equipped with every modern convenience for doing work quickly and economically, the company should be able to obtain its share of the business in sight.

Mr. Holthoff has had an experience of some twenty-two years in connection with mining and mechanical engineering in the mining regions of the West, designing and superintending the construction of mining and metallurgical plants, and is well known throughout the mining world. He was with the E. P. Allis Company as chief engineer of its mining machinery department for some seven years.

NEWS & NOTES

S a result of the tug strike on the great lakes the United States government may provide steam capstans, or install an electric trolley system at the Soo canal. This means that interference with navigation in the future will be made impossible if the plan is carried out.

The Emperor of Germany is showing great interest in motors in which potato alcohol is used as fuel. A satisfactory alcohol motor does not seem to have been constructed as yet, although every motor-maker is seeking for improvement. Successful tramway motors were exhibited in Berlin last February, and the War Department is now advertising for military automobiles using alcohol. Emperor William's interest in the alcohol motor is largely inspired by his desire to help German agriculture by opening a new career for the potato.

The strike of the 1,750 employes of the Singer Manufacturing Company, at South Bend, Indiana, ended on April 28th when the men went back to work after being out ten weeks. They struck for an advance of 2½ cents an hour in wages, and demanded that a contract be signed, agreeing to their demand. The manager refused to do this, but promised to raise the wages as he saw fit, which he did in many cases, as much as 5 cents an hour, but refused to take back the leaders in the strike.

The Chicago City Railway is planning to spend $8,000,000 in improvements before snow flies the coming winter. Instead of the dozen or more power stations at various points on the South Side, one enormous plant at Thirty-ninth and Halsted streets is contemplated. It will have 30,000 horse power capacity and will cost $3,000,000. For mammoth new car barns and machine-shops a tract containing fifteen acres has been purchased. Ground has already been broken for the machine-shops.

Plans have been made by the South Chicago Furnace Company for the erection of a steel mill to cost $2,000,000 on the company's ground on the Calumet River, between One Hundred and Sixth and One Hundred and Tenth streets, in connection with its present large plant. The new mill will give employment to 2,000 men and be one of the best equipped of its kind in the country. The output will be largely steel for the manufacture of agricultural implements. The Deering Harvester Co. are largely interested.

A new plant in Chicago, to cost between $2,500,000 and $3,000,000 and employ about 5,000 men, will be erected by the American Bridge Company. The plan was approved recently by the directors of the United States Steel Corporation, which will put into the enterprise part of the $50,000,000 raised through the bond conversion. The works will be used to concentrate the work of the the western district. The Chicago plant will be about one mile long, and will be so arranged that material can be handled quickly and cheaply without hand labor. The scheme of concentrating the bridge plants is to secure greater economies in manufacture.

Count Zeppelin, the aeronaut, has, it is said, been ruined financially by his experiments with airships. The Count is unable to obtain any further support in Germany for his projects, and he is breaking up the old frame-works of his airships. He has sold five tons of alumium.

Lord Kelvin, while in Washington, a little while ago, made a statement before the House Committee on Coinage, Weights and Measures in support of the adoption of the metric system. Ninety per cent of the people, he said, who had ever given the matter any thought were in favor of the change. The other ten per cent he classified as "idiots." He may think so, but this is rather strong language for the eminent scientist.

General A. W. Greeley, Chief of the United States Signal Service has lately been on the North Carolina Coast witnessing the experiments in wireless telegraphy conducted between Cape Henry and Roanoke Island, sixty miles distant. The results of these experiments, General Greely said, were satisfactory, and he thinks that the corps have developed for the Government a system of transmitting messages without wires superior to the Marconi system.

Building electric lines in India has difficulties not felt in this country. A line for transmission of electricity from the falls of the Convery, a sacred river, to Koler, in Mysore, has just been built by American engineers. The wooden poles were sunk into sockets seven feet high to prevent the ants from devouring them, and the wires were strung just beyond reach of the largest elephant standing on his hind legs and groping with his trunk.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 11.—Wanted, two or three young draftsmen, on general shop work and details, tracing, etc. Pay according to capability. Those with some shop experience preferred. Good opening for young men. Address, H. E. Harris, care of Murray Mfg. Co., Tottenville, P. O., N. Y.

Opening No. 12.—Wanted, a young man of good address and education, with some shop experience, to learn a line of special machinery and tools, with the view of going on the road as salesman and instructor. Good sense and honesty are strict requisites. Address H. E. A., care of Hill, Clarke & Co., Chicago.

Application No. 31.—Practical mechanical engineer with wide experience in design, construction and installation of machinery; wood, iron and mason construction, and gas engine work. Thirty-six years old, married. Wants position as chief engineer or master mechanic for large concern. Something permanent. Salary of $2,500. Address F. E. S., care of Hill, Clarke & Co., Chicago.

Application No. 32. Young man aged 19, wants place as machinist with opportunity of learning the trade. Has had some experience, and is taking a correspondence course in that line. Address J. E., care of Hill, Clarke & Co., Chicago.

Application No. 33.—Practical Mechanical Engineer, 54 years old, first-class health. Has had wide experience from apprentice boy to superintendent. Wants to better his present position financially. Good references. Address W. B. Y., care of Hill, Clarke & Co., Chicago.

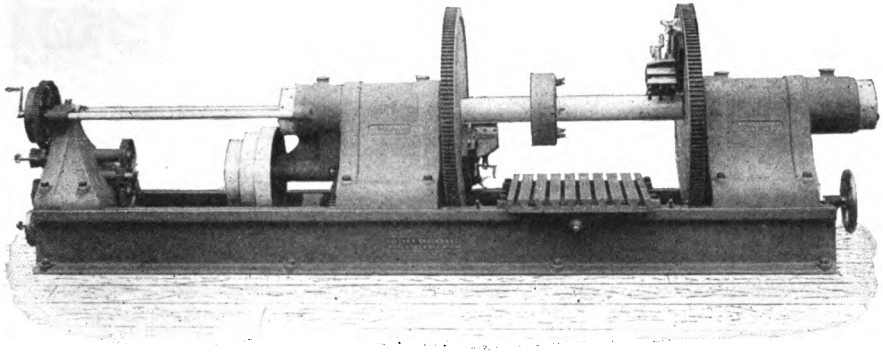
Application No. 34—Position wanted as Superintendent or foreman of machine shop by an American, age 35. Well up in modern shop practice. Good organizer and disciplinarian. Has good education and can furnish good references. Applicant is known to this office. Address E. E. W., care of Hill, Clarke & Co., Chicago.

Application No. 35.—Position wanted as assistant electrician by young man, aged 19, will graduate this June from Southern Mechanical College. References. Address, F. M. J., care of Hill, Clarke & Co., Chicago.

Application No. 36.—Young man, aged 19, desires position of junior draftsman. Is now attending technical school, has done considerable machine drawing and is well up in mathematics. Good references. Address J. M. W., care of Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come in our care will be published free of all charges including corresponding with the interested parties.*

Cylinder Boring Machine For Sale.



Through a firm going out of business, we have secured a Sellers Cylinder-boring machine which can be had for a very moderate figure.

It is fitted with two facing heads, and has three cutter heads. The boring bar is 6 inches in diameter, distance between face plates is 48 inches, and height of bar above carriage is 15 inches.

The machine is complete with countershaft and in fine condition. If interested write to our Chicago store.

New Designs Supercede the Old.

ALIVE manufacturer is never content with producing the same machine year in, year out, but is constantly striving for improvements, better design and construction, aud more adaptability. This movement accounts for the vast modern improvement in all lines as well as the mechanical, but especially so with it. As soon as a new style is brought out, the former head of the class is relegated to second place and must give way slightly to the newest thing. It is the quick perception of the value of new things and the rapid relegation of the old to their proper place, be it the other corner of the shop or the scrap pile, that has advanced American shop methods and manufacture to the place they hold today. The new designs must replace the old.

As an example of this we now have in our Boston store a new Bardons & Oliver No. 6 Turret Lathe, complete with Friction Geared Head, Automatic Chuck, and wire feed. Capacity 3 inches through the automatic chuck. This is a new machine, but on account of the new design that is being brought out, it is old style, and will be sold at a material reduction.

Air for a Steam Hammer.

WHERE there is already a reservoir and general equipment for compressed air tools around a shop it will be found very convenient sometimes to use the air pressure to run the steam hammer, if it be not too large.

I have seen this means employed on a hammer in the forge shop of a large concern where they employed all sorts of compressed air tools, and they had a long radius elbow on the exhaust pipe which was located so that it could be readily directed on the anvil, keeping it free from dirt and scale at all times. The man who operated the hammer said it was a very convenient scheme and that they used the 80-pound pressure from the regular reservoir. OBSERVER.

Sensitiveness of a Telescope Lens.

SOME years ago a contributor to *The Youth's Companion* paid a visit to Alvan Clark at Cambridgeport to witness the testing of the huge lens for the famous Lick telescope. After the usual tests for imperfections, Mr. Clark proceeded to show the wonderful sensitiveness of the lens to outside influences; such as the heat of the human body. The contributor narrates as follows what happened:

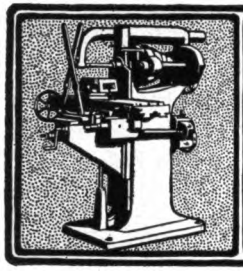
"He (Mr. Clark) walked down to the lens and held his hand under it about two feet away. Instantaneously a marvelous spectacle burst into view. It seemed as if the great glass disk had become a living volcano, spurting forth jets of flame.

"The display was dazzling. Waving, leaping, dancing, the countless tongues of light gleamed and vibrated; then, fitfully, reluctantly, they died away, leaving the lens reflecting only a pure, untroubled light.

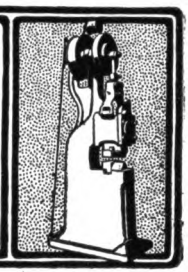
" 'What is it? How do you account for the wonder?" were the eager questions.

"It is only the radiation of heat alternately expanding and contracting the glass. If I had put my hand upon the lens itself, the phenomenon would have been even more violent."

"To a person ignorant of lenses the almost supernatural sensitiveness of a mass of glass weighing several hundred pounds was astonishing, but to the scientist it is an every-day matter, for he has instruments that will register with unfaltering nicety the approach of a person fifty or a hundred feet away."



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

LIST OF SECOND-HAND TOOLS IN CHICAGO.

SECOND-HAND LATHES

One Fitchburg Lathe. 15"x5'.
One Blaisdell Lathe, 13"x5'.
One 14" x 5' Engine Lathe.
One 15"x5' Plain Lathe.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One 2-Spindle Slate Sensitive Drill.
One Baush 8 spindle Multiple Drill, circular pattern. For 1" Drills.

SECOND-HAND SCREW MACHINES.

One ⅛" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No.2 Bardons & Oliver Turret Machine, plain head.

SECOND-HAND CYLINDER BORER.

One Sellers Cylinder Borer, with facing heads. Will bore and face cylinders, 24" diameter and 36" stroke and is in fine condition.

SECOND-HAND PLANERS.

One 36"x36"x12' Wood & Light Planer.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Fisher Boiler-Plate Chipper.
One No. 2¼ Pratt & Whitney Cut-off Machine.

NEW AND FIRST-CLASS TOOLS IN CHICAGO

NEW BRAINARD AND OTHER MILLING MACHINES.

Write for Special Circular.

NEW TURRET LATHES.

One Bardons & Oliver No. 15 Brass Lathe, with friction back gears and set over turret.

NEW BORING MILL.

One 37" Baush Boring Mill, double head.

NEW DRILLS

One Foote, Burt & Co.'s 3-spindle, Universal Adjustable Bench Sensitive Drill, automatic feed.
Two New 6 spindle Foote, Burt & Co. Multiple Drills. Circular heads. 14" drill circle. Capacity ⅝" drills.

HILL, CLARKE & COMPANY,

Machinery Merchants.

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance, 153 Greenwich street.

Small Advertisements will be published in this department at the rate of ten cents for each 15 words (or fraction thereof). If desired, answers may be addressed in care of Hill, Clarke & Co. without further cost.

FOR SALE—Flather Planer, 30"x30"x14', with two heads on cross-rail. Address Hill, Clarke & Co., Boston, Mass.

FOR SALE—One second-hand 4-horse power Gasoline Engine, complete with pipe fittings etc.; in good condition, Price, f. o. b. Chicago $150.00. Bargain. Hill, Clarke & Co., Chicago

FOR SALE—One Pawling & Harnischfeger horizontal Double Post Drill, with 7 feet vertical movement; table 48x60 inches, 15 feet of track; good condition. Hill, Clarke & Co., Chicago.

FOR SALE—One No. 5B Becker-Brainerd Milling Machine. Address Hill, Clarke & Co., Boston, Mass.

FOR SALE—John Adt Wheel Riveter. Will take up to 80-inch wheels. New machine, but will sell at very low price. Address Hill, Clarke & Co., Chicago.

FOR SALE—One Johnson Engine Lathe, 30 in. swing, 24 ft. bed, complete with compound rest; built by I. H. Johnson, Jr. & Co., Philadelphia. Ordered by a customer who made a mistake in size—he needed a larger one. It is a standard lathe, just completed and ready for shipment. Address Hill, Clarke & Co., Chicago.

FOR SALE—Sellers Cylinder Boring Machine, which will bore cylinders up to 24" in diameter and 36" stroke. It is fitted with two Facing-Heads, has a 6" boring-bar and three cutter heads. Machine is complete with countershaft and in perfect condition. Just the thing for some railroad shop. Address, Hill, Clarke & Co., Chicago.

FOR SALE—One 24" semi-automatic turret lathe built by the American Turret Lathe Co. Only one year old; a great bargain. Address, Hill, Clarke & Co., Boston.

The Business to Learn.

"I SEE," said Mrs. E. Z. Mark, "that J. Pierpont Morgan's wages as a trustmaker has been $172,500,000 for the past year and a half. That's pretty good for a short time."

"By Jiminy," exclaimed Mr. Mark, "let's telegraph our boy to come right straight home from Cornell. What's the good of studyin' this here civil engineerin' when he might just as well be puttin' in his time learnin' to be a captain of industry?"

A Boy's Wages.

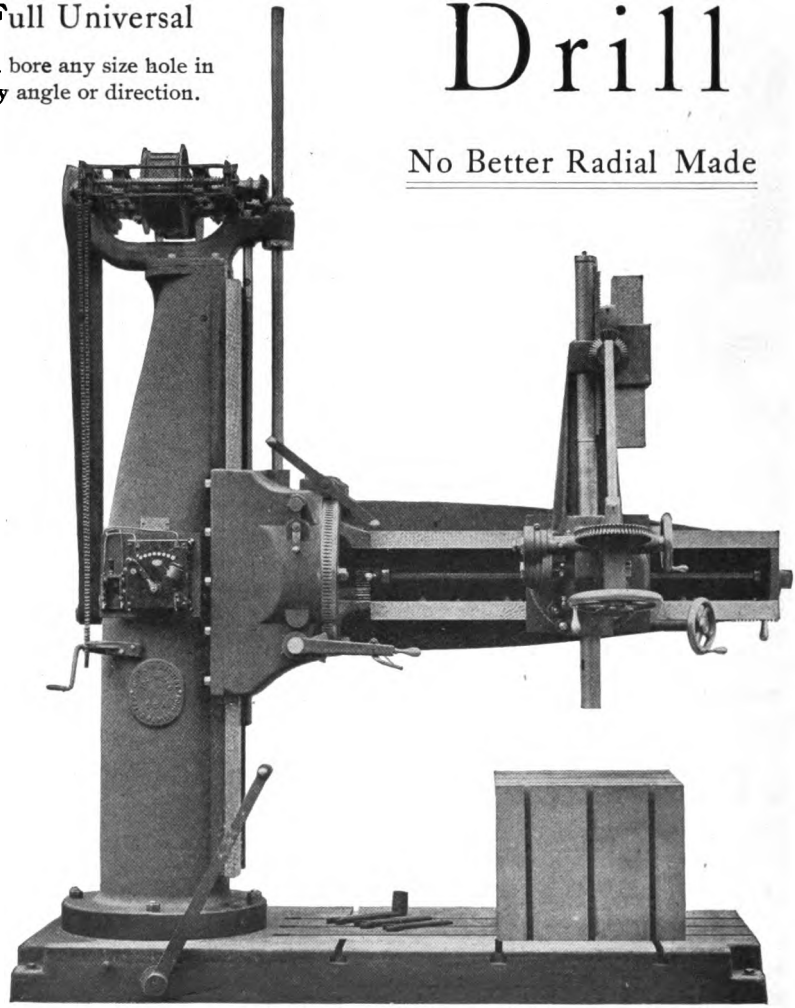
SPEAKING of boys, Sterling Elliot says, according to the *American Machinist*, "I wanted to hire a boy. One called, and, after questioning him, I decided to have him come to work the following morning. As he was going out the door he said, 'How much pay will I get?' I replied, 'You will get whatever you are worth, and the more you are worth the better I shall like it.' Next morning I received a postal card from him stating that he thought best not to come, as the pay was entirely too small."

"Western" Radial Drill

Full Universal

Will bore any size hole in **any** angle or direction.

No Better Radial Made



Built by the WESTERN MACHINE TOOL WORKS, Holland, Mich., and sold only by

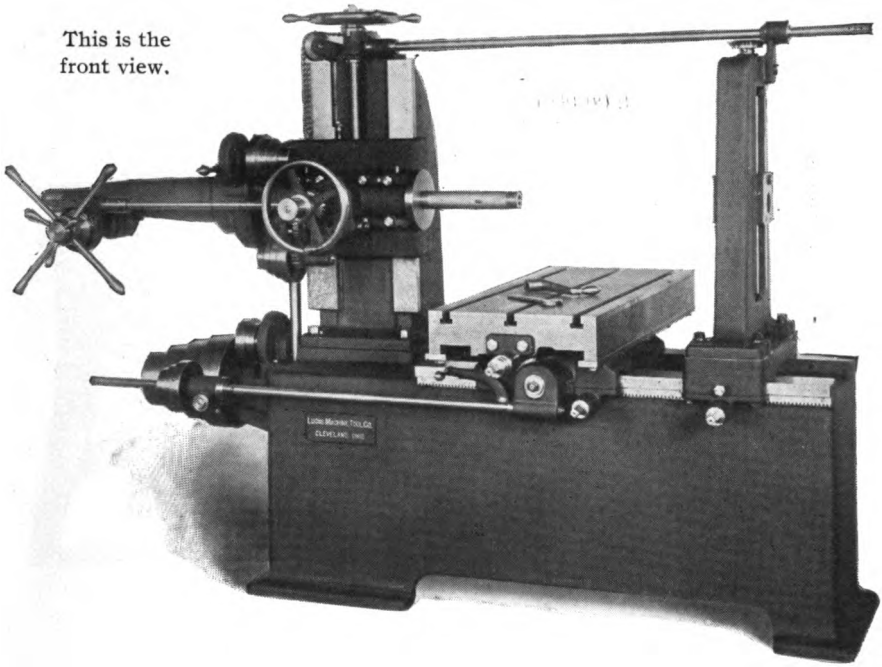
Hill, Clarke & Company,

Machinery Merchants

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance at 153 Greenwich street.
PITTSBURG REPRESENTATIVE: Chas. G. Smith Co., 347 Fifth avenue.

When writing, please say you saw it in SHOP TALK.

"Precision" Boring, Drilling and Milling Machine.



We Absolutely Guarantee Permanent Alignment.

Other manufacturers will not guarantee perfect alignment even when their machine reaches its destination.

Do you see the point? Buy a "Precision."

MANUFACTURED BY

LUCAS MACHINE TOOL CO., Cleveland, Ohio.

FOR

Hill, Clarke & Company,

Machinery Merchants

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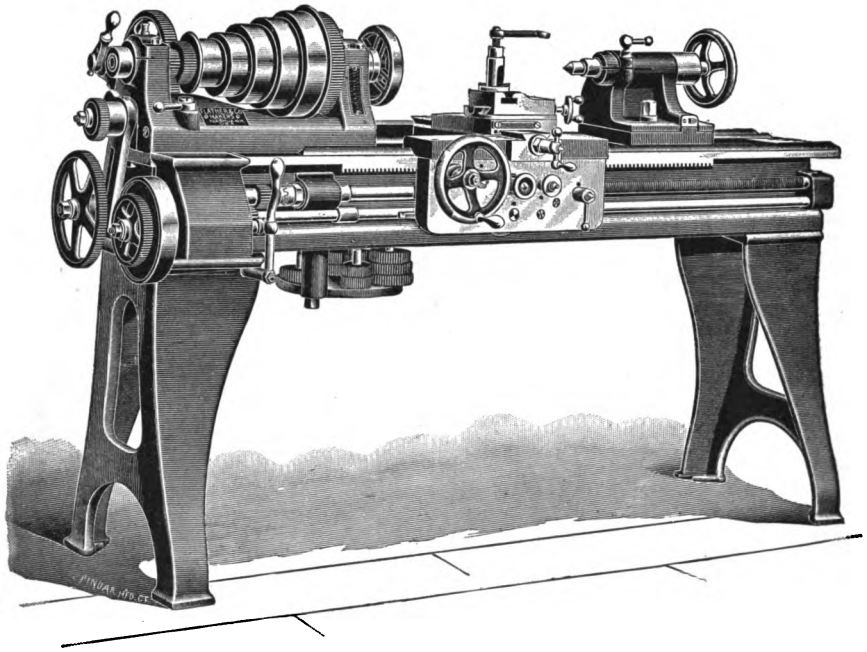
PITTSBURG REPRESENTATIVE: Chas. G. Smith Co., 347 Fifth avenue.

When writing, please say you saw it in SHOP TALK.

New 14-Inch Engine Lathe.

1901 Model.

Designed to meet the latest requirements. Powerful, strong and rigid. Combines simplicity, extreme accuracy, and ease of operation, with good workmanship and material.



SPECIFICATIONS.

Length of bed	6' 0"	Width of cone face	2½"
Actual swing	15"	Number of steps on cone pulley	5.
Swing over carriage	9"	Back gear proportioned	7¼ to 1.
Takes between centers	2' 10"	Cuts threads	4 to 72.
Diameter of front bearing	2¼"	Diameter of countershaft pulleys	10"
Length of front bearing	4"	Width of countershaft belt	3½"
Diameter of hole in spindle	1"	Speed of countershaft	40 revolutions
Diameter of nose on spindle	2¼"	Weight	1550 pounds

This lathe is also for use in tool rooms, and for experimental work, and can be furnished with draw in chuck and collets. Pans are also furnished, to go under full length of lathe bed, when required.

FLATHER & COMPANY

Makers

Nashua - - - New Hampshire

HILL, CLARKE & COMPANY, Agents, Boston, New York, Chicago.

"Shop Talk"

SIXTH NUMBER OF THE SECOND VOLUME.
JUNE, 1902.

The Morton Draw-Cut Shaper and Some of its Advantages.

N considering the usefulness of the Draw-Cut Shaper, it is well to turn to some of the principles which are theoretically correct, and, when put into actual practice, have proven themselves to be mechanically correct.

A few years ago the Morton Company, who were the first to manufacture shapers of this principle, had occasion to accomplish work which was out of the reach of any planer that was included in their regular machine shop equipment. To accomplish this work, a small sized portable Keyseater was secured to an angle plate in such a manner that it could be brought to bear and operate on the surface to be machined, and it was demonstrated clearly in this operation that the advantages of the pulling cut principle were many. With the cutter bar measuring 3½" by 2½" in cross section of steel, perfect cuts were made over the surface 24" in length, and the results obtained from this service were such as to induce the Morton Company to construct a shaper with the draw cut. It was found, upon careful investigation, that the vibrations in the cutting tool were practically overcome, and that the efficiency of the tool was greatly increased. Also that it did not require the amount of fastening devices, binders, bolts, etc., to hold the work in position, and that a tensile strain was placed upon the ram instead of an upsetting strain, the real action of the tensile strain being to decrease vibrations while the action of the upsetting strain is always to increase vibration.

To illustrate this principle further, a piece of wire, if it were strong enough to stand the strain, when placed under the drawing or tensile strain could be raised to such a point that it could not be made to vibrate, while if the strain were reversed and an opposite strain brought to bear upon the same piece of wire, it would simply kink and roll up.

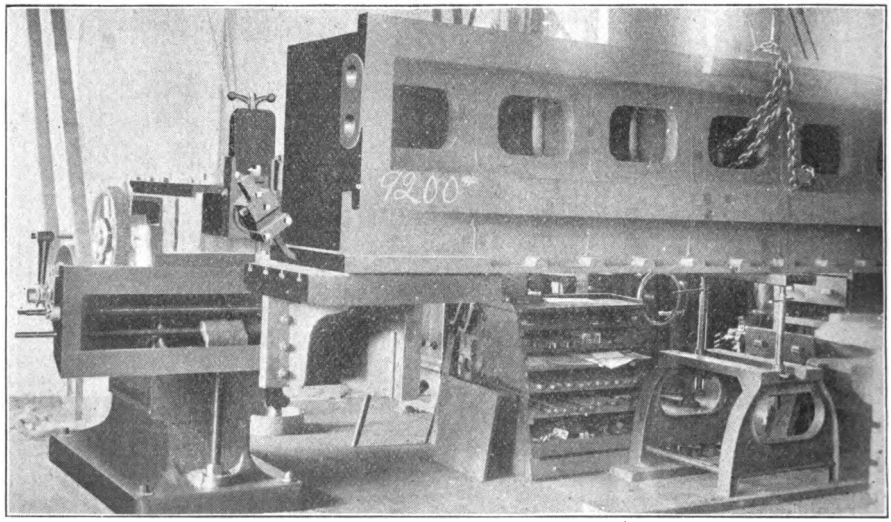
This same principle applied to the ram of the shaper illustrates clearly one advantage of the pulling cut.

One other advantage of great importance is that the tool, if the point does not project beyond the body of the steel from which it is forged, is naturally a spring tool. Where it is necessary to lay out a piece of work by lines, and to cut or remove the metal to these lines, they are always on the outside and are not broken off or effaced until the piece is finished.

We only name these as a few of the advantages of the Draw-Cut Shaper, and to illustrate, we show on the next page a cut of a 36" Morton Shaper machining a strip on the end of a casting 14 feet long and weighing 9200 pounds. By referring to the cut, it will be readily seen the manner in which this piece was handled, the outer end being set on an adjustable jack

or support, and the end to be operated upon being placed on the shaper table. The action of the drawing tool in this particular case was such as to bring the strain of the cut directly against the saddle or apron of the shaper. For this reason, it required only one bolt to hold it in position. This illustrates one of the many emergency jobs which quite frequently come in many machine shops, and well illustrates how difficult it would be to accomplish work of this class on an ordinary push-cut machine.

chine to take heavy cuts." The same remark would have been made about machine tools in general a few years ago, but the time has now come when the trend of the general design of machine tools is heavier, heavier cuts, heavier work, and more rapid production, and the reason why the requirements in a general machine shop practice are not for heavy cuts on a shaper, is that there have never been shapers designed, until the draw-cut principle was advanced, which would meet the requirements of heavy



THIS SHOWS A 36-INCH DRAW CUT SHAPER AT WORK ON A 9200 POUND CASTING.

There are also many instances where it is necessary to cut a piece of work of irregular shape. With the ordinary push-cut machine only light cuts may be taken, while with the pulling cut, much heavier cuts may be taken without danger of straining the tool in any way, and in many instances forming tools may be used for the final shaping of the piece.

The only disadvantage which appears with the pull-cut is to get users to thoroughly understand the real merits of the tool, and oftentimes the remark is made that "We never have any use for a ma-

cutting, but after such tools are once successfully installed in a shop, the advantages are plainly brought out. With this principle practically applied, machines have been constructed which operate successfully on a 6-foot stroke.

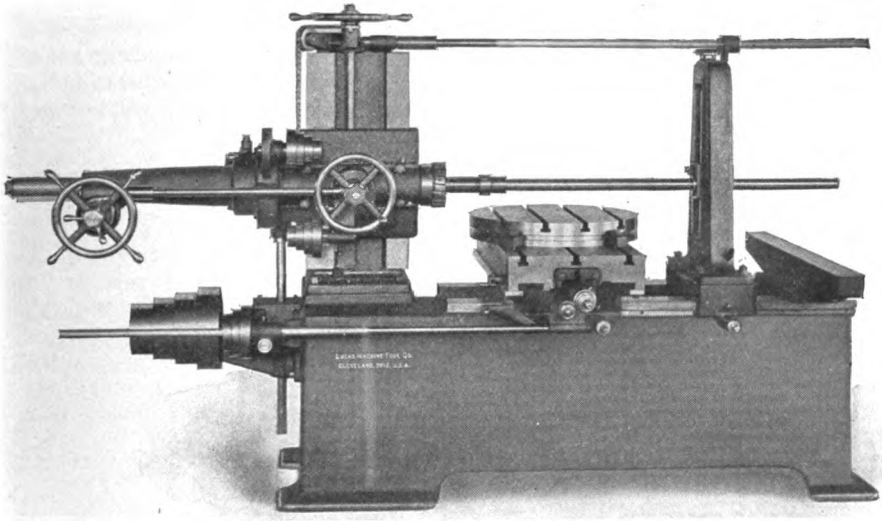
The draw-stroke shaper is well adapted to general as well as special work, and is a tool whose value in a general machine shop is appreciated when once placed in operation.

The Morton Company manufacture a large line of shapers constructed on this principle, some of them being especially big machines. Their largest one was described in May SHOP TALK.

The Latest Type of "Precision" Boring Machine.

THE Lucas Precision Boring Machine is now being built with a longer bed than formerly with a view to accommodating longer work. The illustration shows the new machine, which is substantially the same as the former one, all the valuable features of which are, of course, retained.

The manufacturers of this boring, drilling and milling machine, guarantee its permanent alignment, which is an important point to be regarded in the selection of a boring machine. Other manufacturers who place a machine on the market, the table of which is raised and lowered by two screws, are unwilling to guarantee permanence of alignment, as it is practically impossible to construct one of that style which will remain in line. Indeed, many of them will not even guarantee the accuracy of their machine upon its reaching its destination. In contradistinction to this attitude, the assurance of the manufacturers regarding the accuracy of the "Precision" machine is certainly a point much in its favor.



FRONT VIEW OF THE NEW LONG BED BORING MACHINE.

The bed of this machine is of deep box section, and rests on three points, insuring stability and guarding against flexure when placed on uneven floors. The boring spindle is of crucible steel threaded on the end to receive chucks or other attachments. It is mounted in a sleeve which terminates in a face plate, affording means for attaching facing mills or a facing head. The spindle has both quick and slow hand motion conveniently arranged, and has four changes of automatic feed.

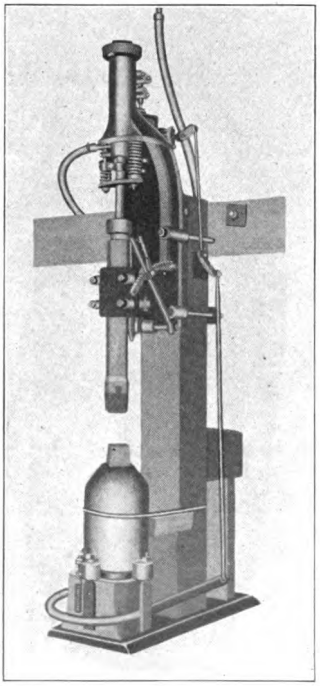
The table is of unusually liberal proportions, especially in depth, to prevent springing in clamping work to it. Six changes of feed with automatic stop are provided for it. A new swivel table has just been brought out and is shown on the machine in the illustration. This is a very convenient addition to the equipment.

The yoke for supporting the outer end of the bar is mounted on a base which is

provided with means for longitudinal adjustment on the bed, and the outer support for the bar is geared to raise and lower with the spindle. A special auxiliary table which is useful for supporting extra long work that is to be face milled or drilled in the end, can also be placed upon the bed, thus handling work which it is difficult to do in any other way. In fact the whole machine is one which will perform with great accuracy and to advantage, a large number of operations.

A Post Hammer of New Design.

THE American Engineering Works, Chicago, have recently designed a small post hammer, to be operated by steam or compressed air, and particularly adapted to general blacksmith shop work. It operates very quickly and has a range on forging work of 2½ inches in diameter and smaller.



The action of the hammer is the same as that of a large steam hammer. The ram can be regulated to strike a blow of the full force developed by the falling weight, with the momentum due to the pressure of the steam or air behind it, or it can be regulated so as to give the lightest possible blow, merely touching the object on the anvil without doing any work.

The cylinder is 3 inches in diameter with 10-inch stroke, and is cast in one piece with the frame. The exhaust ports are arranged so as to keep the cylinder always drained. The valve is under perfect control and is operated by a foot treadle or by a hand lever The steam valve is controlled by a cam working on a cam path on the back of the ram, the position of the cam being governed by the operating levers. There is also provided a safety device to limit the stroke of the

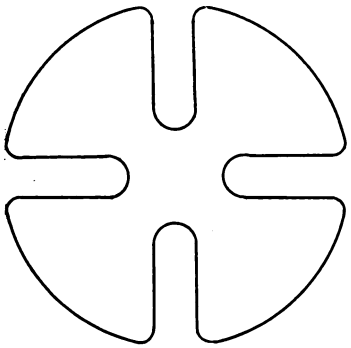
piston. From the center of the die to the side of the post supporting the frame is a clear space of about 10 inches.

The hammer is usually arranged for bolting to a wooden post 8x8 inches. Special attachments can be furnished for bolting to an I beam or other form of wrought steel column, or where preferred a steel column made of extra heavy wrought pipe is furnished, together with necessary clamps for properly clamping the frame of the hammer.

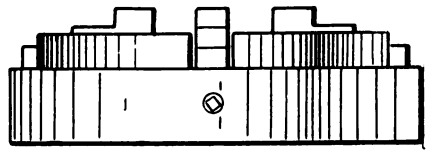
The ram is a solid steel forging, square in form where it passes through the lower part of the frame which acts as a guide. The lower end of the ram is arranged to receive the upper die in such position that it stands at an angle of 45 degrees to the post supporting the hammer, thus enabling long pieces to be worked either way of the die without coming in contact with the post. The upper die is a steel casting having a face 2½x5 inches dovetailed to the ram and fastened with wedges. The lower die is a steel casting having a face 2½x5 inches dovetailed to the anvil and fastened with wedges so that it is easily removable. The anvil is designed to be secured to a 12-inch wooden block set on end, the anvil being bolted to the block with lag screws. The falling weight is 100 pounds. The weight of the lower die and anvil is about 600 lbs.; the total weight, about 1,050 lbs.

A Simple Device.

IN one of the Chicago machine shops where there are a large number of flat rings to be turned up so that the two faces will be exactly true and parallel, a simple device is employed for accomplishing this result with ease and accuracy. A round flat plate, turned true, is slotted out, as shown on the left of the accompanying illustration, so that it will slip on easily over the jaws of a chuck and set solidly against the body of it. This plate may be any desired thickness according to the size of work to be turned up, or there may be several of them to accommodate different thicknesses of rings.



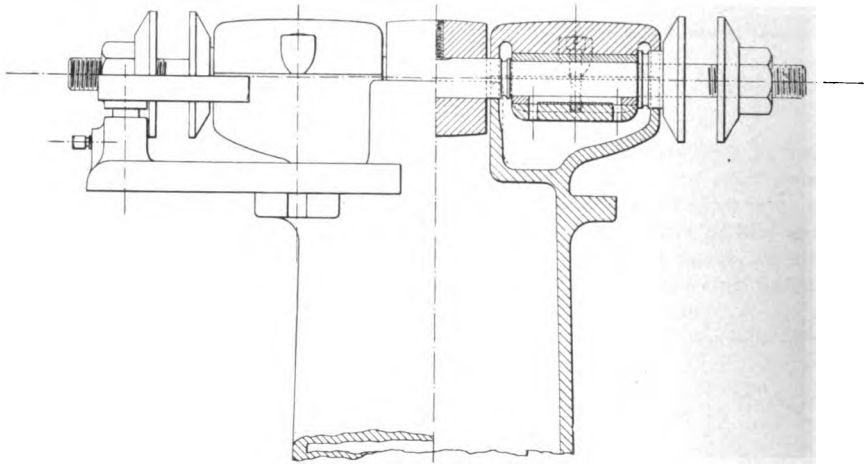
The right-hand figure of the illustration shows how the chuck and plate go together, and it may readily be seen that the two sides of any ring are bound to be parallel if it is set in snugly against this plate before facing off. The advantage of this method over chucking in the jaws alone is obvious, as the chuck jaws are apt to be a trifle loose, and might be in or out from the face of the chuck an appreciable amount, thus destroying the parallelism of the two sides of the ring.



Very thin rings can be turned up in this way. H. W. M.

A Few Details.

THERE are several constructional details in our new Chicago Grinder different from those of other grinders, and as the pictorial description is much more quickly apprehended than a description drawn in words, we show herewith a drawing of the upper part of the machine. Details are important, for, after all, what does a perfectly working mechanism represent but a combination of details carefully planned and carried to completion.



HALF SECTION OF THE CHICAGO GRINDER HEAD.

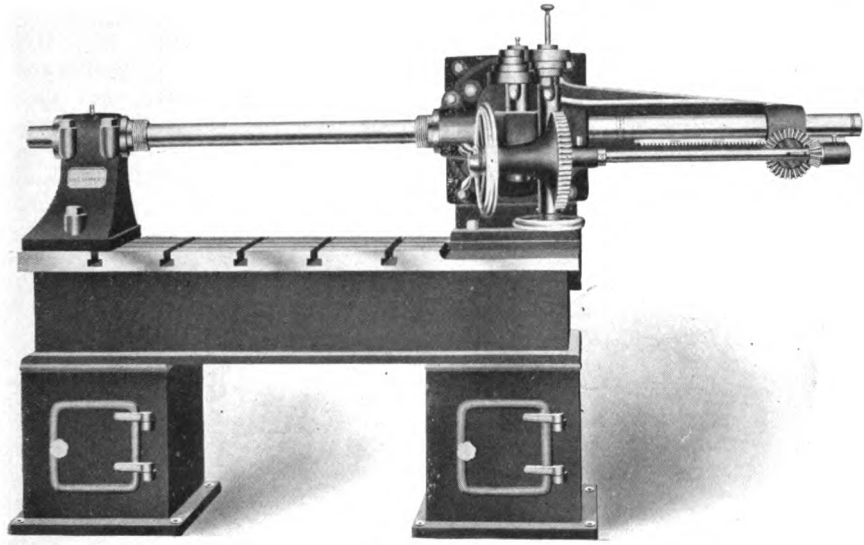
There are two very essential points about a grinder: first, rigidity, and second, bearings that will exclude all dirt and grit. The Chicago Grinder fully meets these two conditions. The column and head are cast in one piece, giving absolute unity and rigidity. The bearings are designed to oil continuously, and never admit a particle of grit, as may be seen from the drawing. The small groove cut in the spindle at either side of the actual bearing surface, but yet inside the cap, effectually stops the possible advance of dirt along its length, as well as retaining the oil in its proper place. No oil can creep along the spindle to be sprinkled on the operator.

There are no oil holes in the cap, where dirt might easily gain ingress, but, on the contrary, the oil cup is placed below the spindle, opening directly into the oil receptacle, which is cored out of the column. The wick, rising from this abundant supply of oil, is in actual contact with the shaft for several inches, and provides constant and ample lubrication. No grit can mount the wick, so that even should some be introduced with the oil in the infrequent act of re-filling, or in any other way, it would be harmless. One oiling lasts three months.

There are other details on this machine worth remarking, such as the solid character of the work rests, the pleasing outlines, the removable pan, and even the fine finish of the machine, but why dwell upon them? You can readily see that this latest development of the dry grinder is the best, and that it is the one you want. All our machine tools have the reputation of being money savers, and oh, how many customers inform us our tools do more than we ever contended for them.

A Long Felt Want Supplied.

OR a long time there has been a demand for a reliable cylinder-boring machine of moderate dimensions, suitable for boring small steam and gas engine cylinders, but up to the present time there has been no machine upon the market especially intended for this class of work. It is for this reason that we are now presenting the "Western" Cylinder Boring Machine shown in the accompanying illustration, with a view to supplying the demand.



THE "WESTERN" CYLINDER BORING MACHINE.

Cylinders are unhandy jobs to bore out in a lathe, especially when the valve chest is cast with them, and yet for small work manufacturers have not heretofore felt like investing in a large and expensive boring machine, feeling that the size and amount of their product did not justify so heavy an expenditure.

Our new machine is built to sell at a very moderate price, yet is constructed with strict regard for accuracy and convenience in every particular.

The spindle is provided with four power feeds which are changed from one to another by means of a sliding key. There is also a quick and a slow hand motion to the spindle, and it is fitted with ball bearings. The center line of the spindle is 12 inches above the table, and the distance between the head and outer support is 30 inches. The table and bed are of stiff construction to resist all strain. A simple form of facing head is readily attached to the spindle.

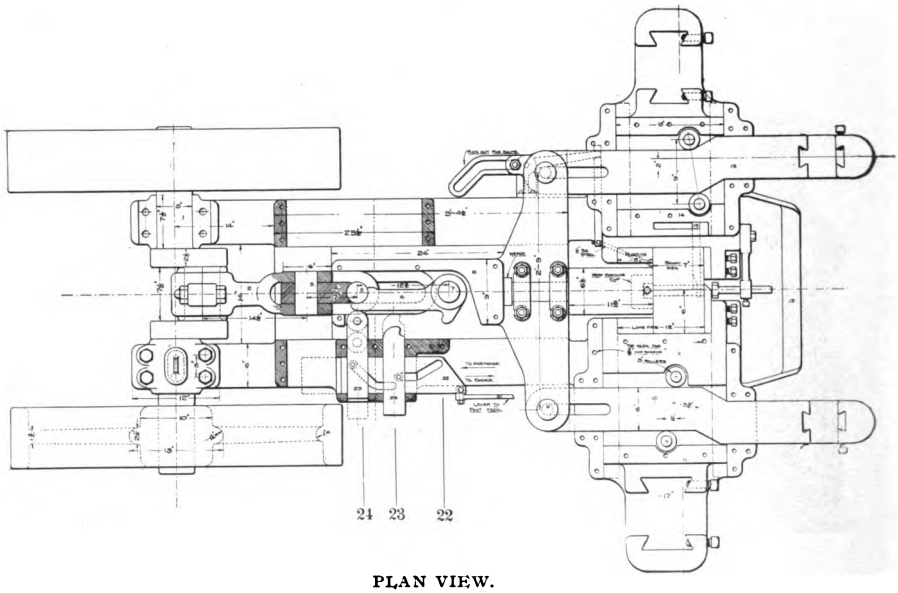
The drive is accomplished from a single pulley by means of a variable speed transmission which gives any speed of spindle from 10 to 50 revolutions per minute.

Manufacturers of small engines will find it worth while to employ such a machine as this, and we would advise them to write us regarding terms and prices. There is nothing like having the best and most suitable machine tools to cut down cost of manufacture and improve your product.

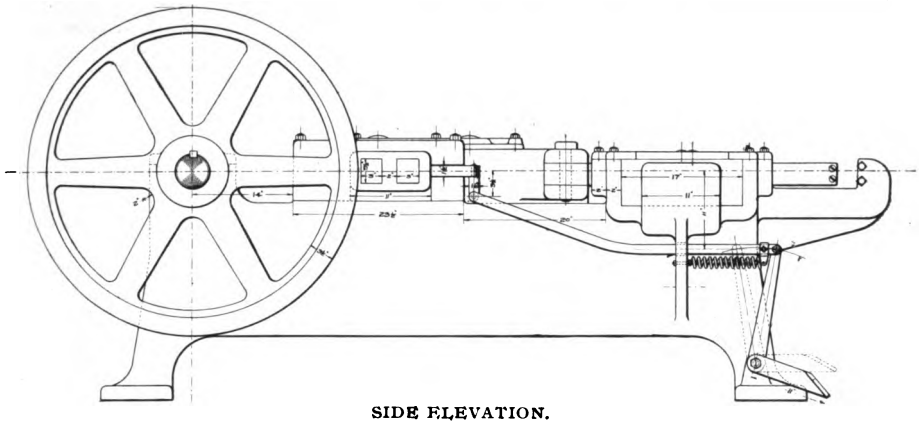
The Wagner Bolt and Forging Machine.

IN these days of labor-saving machinery, cost-cutting and improved shop methods, the economical modes of handling material, working it up and machining it have been carried to such a degree that one is no longer surprised to find some new economy practiced in lines heretofore neglected or unthought of. The bolt machine, which has been supposed to do just so much work and no more, now, in its turn, comes to the front with a capacity for increased output. In the Wagner Bolt and Forging Machine shown here in elevation and plan, the designers have proceeded with a view to doing several operations at one heat, whereas former machines ordinarily operated at most one set of dies and a cutting-off attachment. The Wagner, in addition to the regular ram or plunger, has five other die holders attached by various cams, which may be adapted for bending, cutting-off, punching and a variety of operations. The idea of this is that a number of operations may be performed upon a piece of work at the same heat, thus economizing largely in time required for additional heating and die-changing, as well as in the number of machines and operators required to turn out work.

One crank provides the action for all the operations, and the auxiliary motions may be disengaged from the main cross-head when desired. The mechanism for disengaging the cross-head from the crank is adapted to give one or more blows to the bolt, as may be necessary for finishing, and is operated by a foot pedal at the front of the machine. This foot pedal operates a sliding plate (shown in the plan view as No. 22) which has a pair of grooves provided in its surface, engaging rolls in a pair of sliding pieces (Nos. 23 and 24.) As shown in the plan, the mechanism is in engagement and this relation remains as long as the foot pedal is depressed. When the pedal is released the sliding plate moves to the other ex-



PLAN VIEW.



SIDE ELEVATION.

tremity of its range of motion, and the two sliding pieces move into new positions, so that the link (No. 6) on returning to the back end of the stroke, engages the sliding piece No. 24. This causes the link to swing about its pivot, thereby releasing the cross-head from contact with the pin which communicates the reciprocating motion to the ram. While this relation exists, the crank will continue rotating, which, however, will simply cause the block at the end of the connecting rod to slide freely within the cross-head without moving any of the remaining mechanism of the machine.

This machine, as may be seen, is adapted for a variety of work, such as small anchors, etc, as well as a large line of bolts and pins, with cotter-pin holes and without.

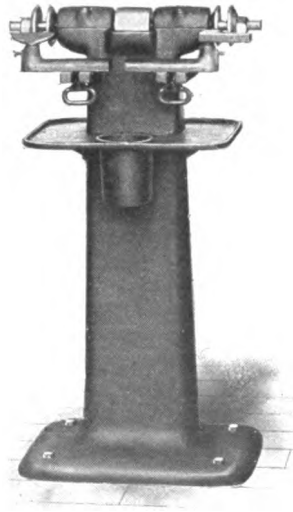
Factory Leaks.

THE incidentally overheard remark of a new employe to an older hand a few days ago has set me thinking on a subject of no small importance in machine shop economy, says a contributor to the *American Machinist*. After expressing surprise at the meagre supply o- small tools obtainable, he went on to say that he noticed most of the tool-makers appeared to have a little private tool department of their own!

Now, is not this often the case, and should it be so? Is it a wise plan if a counterbore, arbor, reamer or what not is required, to have a man stop on his job to make it and when done with it to put it in his drawer? I think no one will admit this, yet it is done in a great many shops daily.

Even supposing he turns it into the toolroom, it is probably made hurriedly, out of any piece of scrap stock handy, with special reference to that particular job and not likely to be very useful on others. In other words, it is not made in harmony with that class of tools to which it belongs, in proportion or style. Would it not be better to have on hand such tools of which the use could have been foreseen, made preferably by those in the business for these are days of specialists—or, if home made, designed in reference to others of its class, either by existing and readily obtainable formulas or by good example, marked and finally stowed away in appropriate places provided for them, where they are readily accessible to any and all who properly have use for such a tool?

It is true that sometimes it will be necessary to have a tool so special in its character and proportions that it will not agree with the ordinary, but these cases are comparatively few, and even then the proper depository is the toolroom.



The 12-inch Chicago Grinder with Countershaft.

Let us tell you more about them—or see May SHOP TALK for a description.

EDITORIAL SHOP TALK

JUDGING from the large number of compliments we received for our May number, SHOP TALK has a large and growing number of readers, friends and admirers. The hearty commendation it receives upon all sides is very gratifying, and spurs us to further effort in the direction of pleasing our readers. For this reason we would be very glad to hear from any and everyone so inclined, what feature or part of SHOP TALK they find most interesting or instructive. SHOP TALK occupies an unique place in the field of mechanical literature, and to advance its usefulness more and more, we want expressions regarding its conduct and makeup.

Such expressions as "the finest number yet issued," "a very bright and entertaining little magazine," "a clever and well-gotten-up publication," etc., etc., are our groundwork from which to advance to still better things. Justly deserved praise is gratefully received, and justly deserved criticism is oftentimes most advantageous. Let us hear from you about what you think of SHOP TALK.

The next one of the series of articles on Milling Machines and How to Use Them, will be on the subject of "Manufacturing," and will appear in the July number, as it has been found impossible to obtain the necessary photographs and engravings in time for this month's issue. The series will be continued regularly every month from then on.

The Engineer and His Work.

BY VICTOR C. ALDERSON.

THE relation between the engineer and the laws of nature is unique, and differs from the relation that exists between any other professional man and nature. Unlike the geologist, who is limited in his observations to those favorable localities which nature has been kind enough to unfold for his inspection, or the biologist, who must wait for nature to act and then stand as an observer, the engineer pins nature down and forces her to answer his question. It may be only a yes or no, but it is an answer, and since he can vary his questions—that is, the conditions of his experiment, he can ultimately get the information he desires. He deals with the immutable, the unchanging laws of inorganic nature. He alone of all professional men has an unvarying criterion by which he may decide the right and the wrong, the correct and the false. He gets accurate data by which he may build his bridge, construct his dynamo, or lay out his railroad. Departure from these data means failure. Other professional men are subject only to varying human laws and human notions and so get along without ever having before them an absolute standard, but the engineer is forced to be in harmony with natural laws ; his work must be absolutely truthful ; his logic must be without flaw. Sophistry and ignorance are not for him. He must know, and know accurately ; he

must reason, and reason logically. If he does not know the stresses in his bridge, the endurance of his material, or the details of his dynamo, he cannot rank as an engineer. Nature, calmly and dispassionately, is always on guard over him. No other man in the world, I believe, unless it is the chemist or the physicist, is subject to such rigid and unceasing discipline; no man's errors are so glaringly brought to light as his. The lawyer can fall back on the plea that the judge was biased, or the jury packed; the doctor may, perchance, bury his mistakes; but the mistakes of the engineer bury him. We accept his success as natural, because it is in harmony with nature's laws; his errors are glaring, because they are out of harmony with nature. All the world sees his failures. A mere tyro can recognize a poor roadbed, defective machinery, or a dangerous bridge. The engineer has, then, for his ethics the most dignified and exalted standard; he has an absolute and unvarying criterion for truth and error; he has over him a judge who will decide with unerring swiftness that his work is a failure if he violates the law.

Every field of activity in the whole realm of nature may yield something of value to the engineer. His interests are world-wide. As man has climbed slowly up the rugged pathway we call civilization, he has needed more and more the service of the engineer. What was yesterday a theory, becomes a demonstration to-day, and to-morrow we expect the engineer to apply it for our comfort or convenience. As agencies for civilization, engineering works have been given far too little prominence. True it is that Greece has left us a priceless heritage of art and Rome a code of laws, but in the wake of the Roman armies went the engineer, building bridges, roads and aqueducts, making intercommunication the easier and civilization more advanced. To-day, thanks to our railway experts, the world is smaller than ever before—and is steadily growing smaller; for distance is no longer computed in miles, but in length of time in transit. Once New York and Liverpool were three months apart, now less than a week. With the aid of bridges like the St. Louis, the Brooklyn and the Forth; tunnels like the Mersey, the Sarnia, the St. Gothard; canals like the Manchester and the Suez; trains like the limited and the Empire State Express, the engineer has done noble work for advancing civilization by making intercommunication easier and removing that ever recurring obstacle—ignorance of other peoples. The influx of people to the large centers of population has brought forward new problems, not only of travel but of pure water supply, disposal of drainage, public health, all of which the engineer is called upon to solve. Industrial history may be dry reading, because it does not fire the ardor with thrilling deeds on the field of battle. Some enthusiasm may be kindled over the success of Robert Fulton with his steam engine and Edison with his phonograph, but little or none over the success of John A. Roebling in building the Brooklyn Bridge, or the struggle of our civil engineers to make our present railway travel fast and safe. But to the engineering profession as a whole we must grant the credit for being the greatest practical civilizing agent we have.—*Railroad Digest*.

The monkey wrench gets its name from its inventor, Thos. Monkey, of Bordentown, N. J.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 13.—Wanted, a first-class all-around machinist, who is a strict mechanic. One familiar with iron pattern work preferred. Is wanted for tool and pattern room. Permanent job for a steady man. Address H. L. L., care of Hill, Clarke & Co., Chicago.

Application No. 32. Young man aged 19, wants place as machinist with opportunity of learning the trade. Has had some experience, and is taking a correspondence course in that line. Address J. E., care of Hill, Clarke & Co., Chicago.

Application No. 33.—Practical Mechanical Engineer, 54 years old, first-class health. Has had wide experience from apprentice boy to superintendent. Wants to better his present position financially. Good references. Address W. B. Y., care of Hill, Clarke & Co., Chicago.

Application No 34—Position wanted as Superintendent or foreman of machine shop by an American, age 35. Well up in modern shop practice. Good organizer and disciplinarian. Has good education and can furnish good references. Applicant is known to this office. Address E. E. W., care of Hill, Clarke & Co., Chicago.

Application No. 35.—Position wanted as assistant electrician by young man, aged 19, will graduate this June from Southern Mechanical College. References. Address, F. M. J., care of Hill, Clarke & Co., Chicago.

Application No. 36.—Young man, aged 19, desires position of junior draftsman. Is now attending technical school, has done considerable machine drawing and is well up in mathematics. Good references. Address J. M. W., care of Hill, Clarke & Co., Chicago,

Application No. 37.—Good mechanic, 38 years old, fair draftsman, has had charge of experimental department of small shop for eight years. Has also done installation work in power plants, etc. Wishes to become connected with a larger shop where there is a chance for advancement. Address F. D. care of Hill, Clarke & Co., Chicago.

Application No. 38.—Position wanted as foreman of pattern shop, by married man, 44 years old, 23 years' experience in a variety of work. References. Address H. W. H., care of Hill, Clarke & Co., Chicago.

Application No. 39.—Young man 18 years old, graduates from Manual Training School, and wants position. Will go anywhere, and can furnish references. Address I. S. K., care of Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come to our care will be published free of all charges including correspondence with the interested parties.*

NEWS & NOTES

PLANS are under consideration for greatly increasing the capacity of the Illinois Steel Company's works near Chicago. As this is a plant of the United States Steel Corporation, it is probable that President Schwab will make a trip to Chicago at an early date for the purpose of inspecting the works at that place.

A coaling station is being built by the Government at Manila. Sangley Point has been selected by the naval engineers as the most desirable location for large coaling pockets, and coal handling machinery and extensive wharves and fireproof buildings are being erected there for the purpose.

The Brooklyn Rapid Transit Company recently finished a twenty-four hours' count of the number of people carried across the Brooklyn Bridge by bridge and trolley cars. The count showed that approximately 300,000 persons made the trip across the bridge in that time.

It is practically assured that the Sprague Electric Company will be absorbed by the General Electric Company in the near future. The capital stock of the Sprague Company is $5,000,000, and that of the General Electric Company is nine times as great. The absorption of the former company by the latter practically gives the General Electric and Westinghouse companies control of the manufacture of heavy electrical machinery.

Twelve hundred girls employed at Brown Brothers' cigar factory at Detroit recently inaugurated one of the most novel and spectacular strikes ever known in that city, or anywhere else, for that matter. They quit work because J. H. Brown resigned as manager of the plant, and while he declares he resigned of his own volition and does not wish to return, the girls insist upon his restoration as manager before they will return to work. A number of managers are now wondering what sort of a charm Mr. Brown employs.

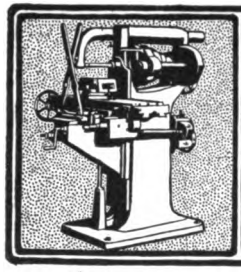
The Machinery Department of the World's Fair to be held in St. Louis in 1904, has announced its intention to make no charges for space in machinery exhibits, to supply power free of charge, to furnish cranes and hoists for the rapid handling of heavy articles, and by controlled transportation facilities to protect exhibitors from extortion by carting and transfer companies. This ought to give encouragement to a large number of machinery exhibitors and make this exposition the most complete in this line of any one yet held.

A speed of seventy-five and perhaps later 100 miles an hour is to be regularly maintained on the third rail electric cars that are to be operated between Aurora and Elgin and Chicago over the nearly finished Aurora, Elgin and Chicago Line. The new system, or that part of it between Aurora and Chicago, will be opened for business the latter part of June. The new line is considered by experts to be the best built electric road in the world.

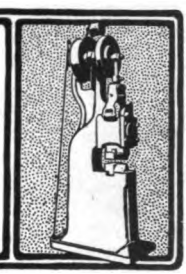
The Western Steel Car and Foundry Company has leased from the Illinois Car and Equipment Company for ten years at $60,000 a year the plant at Hegewisch, formerly operated by the latter, which was partly destroyed by fire a short time ago, throwing 2,500 men out of work. The plant is to be restored, and the lessor agrees to spend $150,000 in an addition to the works. In the agreement of lease it is stipulated that the former company shall have the privilege of buying the property for $1,100,000. The land consists of about 100 acres at One Hundred and Thirty-sixth street and the Calumet River, east of the river and west of the Nickel Plate Road.

American Locomotives Lead the World.

AMERICAN locomotives, running on American rails, now whistle past the pyramids and across the long Siberian steppes. They carry the Hindoo pilgrims from all parts of their empire to the sacred waters of the Ganges. Three years ago there was but one American locomotive in the United Kingdom; today there is not a road of importance there on which trains are not being pulled by American engines. The American locomotive has successfully invaded France. The Manchurian Railway, which is the real beginning of oriental railway-building, bought all its rails and rolling-stock in the United States. American bridges spans rivers on every continent. American cranes are swinging over many foreign moles. Wherever there are extensive harvests there may be found American machinery to gather the grain. In every great market of the world tools can have no better recommendation than the mark "Made in America."



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop, and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

List of Second-Hand Tools in Chicago.

SECOND-HAND LATHES

One Fitchburg Lathe. 15"x5'.
One Blaisdell Lathe, 13"x5'.
One 14" x 5' Engine Lathe.
One 15"x5' Stud Lathe.
One 14"x6' Flather Lathe, hollow spindle, plain rest, and power cross feed.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.

One Baush 8 spindle Multiple Drill, circular pattern. For 1" Drills.

SECOND-HAND SCREW MACHINES.

One ½" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No.2 Bardons & Oliver Turret Machine, plain head.

SECOND-HAND CYLINDER BORER.

One Sellers Cylinder Borer, with facing heads. Will bore and face cylinders, 24" diameter and 36" stroke and is in fine condition.

SECOND-HAND PLANERS.

One 36"x36"x12' Wood & Light Planer.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Fisher Boiler-Plate Chipper.
One No. 2½ Pratt & Whitney Cut-off Machine.

New and First-Class Tools in Chicago.

NEW BRAINARD AND OTHER MILLING MACHINES.

Write for Special Circular.

NEW TURRET LATHES.

One Bardons & Oliver No. 15 Brass Lathe, with friction back gears and set over turret.

NEW BORING MILL.

One 37" Baush Boring Mill, double head.

NEW DRILLS

One Foote, Burt & Co.'s 3-spindle, Universal Adjustable Bench Sensitive Drill, automatic feed.
One New 6 spindle Foote, Burt & Co. Multiple Drills. Circular heads. 14" drill circle. Capacity ⅝" drills.

Hill, Clarke & Company,

Machinery Merchants

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance at 153 Greenwich street.

THE BARGAIN LIST,—(Continued.)

List of Second-Hand Tools in Boston.

SECOND-HAND SPEED LATHES.

One Garvin 10"x2½'.
One Robbins 10"x4'.
One Garvin 11"x4'.
One Spencer 12"x4'.
One Amoor 12"x4'.
One Garvin 12"x4',
One Robbins 14"x6.
One Garvin 15"x5'
One —— 16"x5".
One Reed 17"x5'.

SECOND-HAND ENGINE LATHES.

One American Watch Tool Co. No. 3 with slide rest; counter and grinding attachment.
One Young Bench Lathe 9"x3½", P. R.
One Putnam 14"x5'.
One Blaisdel 14"x5'.
One Dexter 14"x5', raise and fall rest.
One Goddard 14"x6', P. R.
One Pratt & Whitney, 13"x5', R. & F.
One Johnson 15"x6'. C. R.
One Flather, 15"x8', R. & F.
One Star Tool Co. 15"x6', P. R.
One Lathe & Morse 15"x8', R. & F.
One Bullard 16"x8' P. R.
One Blaisdell 18"x8'. R. & F.
One Flather 20"x7', R. & F.
One Blaisdell 17"x19"x8'.
One Blaisdell 20"x8', C. R.
One Lathe & Morse 21"x7½', R. & F.
One Dexter 18"x16'. C. R.
One Oakland 21"x10', C. R.
One Blaisdell 22"x9½'. C. R.
One Blaisdell 22"x10', C. R.
One Draper 22"x12', C. R.
One Blaisdell 20",-25"x6', P. R.
One Fifield 24"x 14', triple geared.
One Blaisdell 24"x11" plain turning.
One Pond Shafting Lathe 30' x22' centres.
One Putnan 83"x20', geared face plate.
One Bridgewater 104"x81', double head and tail stock.

SECOND-HAND SHAPERS.

One Smith & Mills 15" crank shaper.
Heudey 24" friction shapers.

SECOND-HAND PLANERS.

One Lathe & Morse 20"x20"x4'.
One Wheeler 22"x22"x5'.
One Davis 24"x24"x4'.
One Flather 26"x26"x11'.
One Flather 30"x30"x14', 2 heads.
One Putnam 36"x35"x10' 2 heads.
One Oakland 36"x36"x6', 1 head.
One Oakland 35"x35"x 10', 1 head.
One Fitchburg planer, 60"x25', 2 heads, side post to plane 7' high
One Miles planer, 37"x37" x30½', 1 head.

SECOND-HAND MILLING MACHINES.

One Becker Vertical Miller No. 3, without rotary attachment.
One Garvin Hand Miller and centres.
One Pratt & Whitney Lincoln Miller. No. 2.
One Lincoln Miller No. 2.
One Garvin Plain Miller No. 3.
One Cincinnati Universal Milling Machine No. 1.
One Van Norman No. 0 Duplex Miller.
One Brainard No. 15 Universal.
One Brainard Large Index Miller.
One Vanderbeek Universal Milling Machine.
One No. 23 Brainard Milling Machine.
One No. 8 Brainard Plain Milling Machine.
One Gould & Eberhardt 36" Automatic Gear Cutter with rack att. and lot of cutters.

SECOND-HAND DRILLS.

One Slate 1 spindle sens. drill.
One Woodward & Rogers 1 spindle.
One Davis 1 spindle sens. drill.
One Elliott 1 spindle sens. drill.
One Burnham 2 spindle sens. drill.
One Pratt & Whitney 3 spindle sens. drill.
One Pratt & Whitney 4 spindle drill.
One Ames double head 4 spindle geared drill.
One Robbins & Lawrence 4 spindle drill.
One 6 spindle Adt. hardware drill.
One Burnham 4 spindle sens. drill.
One upright drill 20", power feed.
One Prentice 20", power feed, square table, side drive.
One upright drill, 21".
One Prentice drill, 21", back geared.
One Prentiss, 21", B. G. P. F. adj. head, square table.
One Traverse drill.
One Gleason suspension drill.
One New Haven upright drill, 45", power feed. sliding head, back geared.

SECOND-HAND SCREW MACHINES.

One Pratt & Whitney No. 3, plain back geared and power feed, draw bar in spindle.
One Wells Bros, aut. screw machine, ½".
One No. 1 Garvin screw machine with wire feed.
One No. 2 " " " " " "

BRASS WORKING AND TURRET LATHES.

One Brass Workers' Lathe with chasing bar.
One Ames 5 spindle turret lathe.
One Windsor No. 4 turret lathe, plain head, 15", box chuck fitted.
One Dreses-Mueller turret lathe, 18"x6½', friction geared head, 15" box chuck.
One Garvin No. 23 turret lathe, friction head, 15" valve chuck fitted.

SECOND-HAND PRESSES.

One Eaton tempering press.
One No. 2 Manville power press.
One No. 3 foot press.
One Horton press, No. 5.

MISCELLANEOUS.

One Yale & Towne electric traveling crane, 25' span.
One automatic wood screw shaver.
One Pratt & Whitney C. O. machine, 4½", 2 tools.
One two-wheel surface grinder.
Diamond face and hole grinders.
One D. E. Whiton No. 3 centering machine.
One Dudgeon steam hammer, 500 pounds.
One Profiler, 2 spindle.
One H. & R. C. O. machine, 3".
One Pratt & Whitney C. O. machine, 2".
One Wells Bros. cutter grinder.
One Walker twist drill grinder.
One Washburn twist drill grinder.
One Am. Tool & Machine Co., No. 2, oil separator.
One Garvin screw slotter.

Furnace Gas Engines.

A SPECIAL interest is now shown in the iron trade, as to the practicability of the use of furnace gas as a driving power. Up to this time the furnace gases were used only in the hot blast stoves and for generating steam for the blowing engines, but lately they have been burned in specially constructed gas engines. First the gases were freed from dust, and then cooled down from 125 deg. Cen. to from 6 deg. to 8 deg. Cen. by means of flowing water. A beginning was made by driving small gas engines as they are used for electric lighting purposes, but now furnace gas motors are built capable of developing 1,200 horse pow r and are used for driving the blowing engines. As calculations have shown, the furnaces in Germany can produce an energy of 500,000 horse power, and all the furnaces in the world together an energy of 2,500,000 horse power.

Rawhide Pinions.

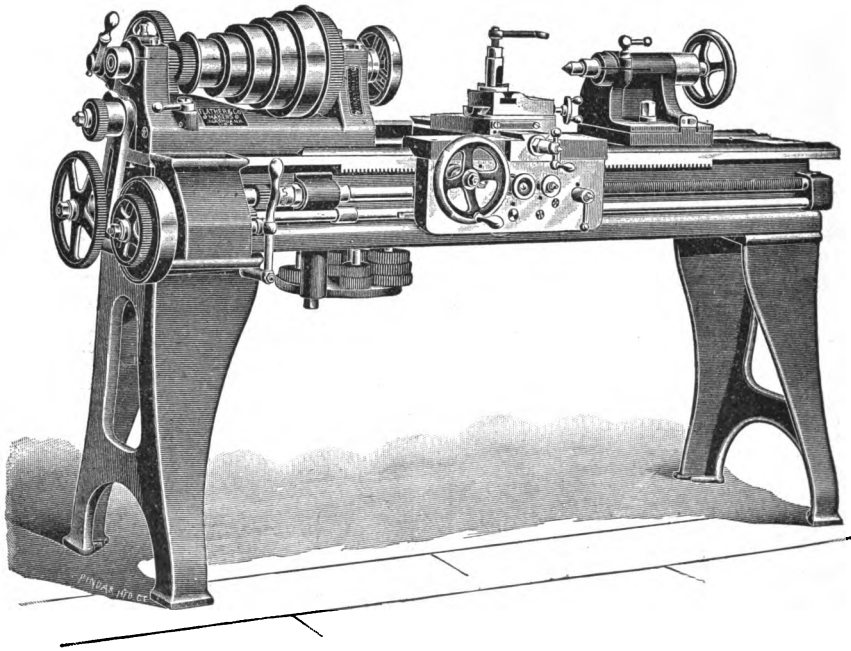
"ONE of the most curious of the many things made nowadays of rawhide," said a man who handles such articles in his business to a *New York Sun* reporter, "is the rawhide pinion or cogwheel. You might think that the teeth of such a wheel would break down and wear off quicker than those of an iron wheel, but as a matter of fact they do not break, and a rawhide pinion will wear as long as an iron pinion, if not longer.

"Such pinions are made of many layers of rawhide pressed solidly together and bolted through and through to metal plates placed on the sides. The teeth cut across the surface of the wheel thus formed are, of course, each composed of many layers of the thoroughly compacted rawhide standing edgewise.

New 14-Inch Engine Lathe.

1901 Model.

Designed to meet the latest requirements. Powerful, strong and rigid. Combines simplicity, extreme accuracy, and ease of operation, with good workmanship and material.



SPECIFICATIONS.

Length of bed	6′ 0″	Width of cone face	2½″
Actual swing	15″	Number of steps on cone pulley	5.
Swing over carriage	9″	Back gear proportioned	7¼ to 1.
Takes between centers	2′ 10″	Cuts threads	4 to 72.
Diameter of front bearing	2¼″	Diameter of countershaft pulleys	10″
Length of front bearing	4″	Width of countershaft belt	3½″
Diameter of hole in spindle	1″	Speed of countershaft	40 revolutions
Diameter of nose on spindle	2¼″	Weight	1550 pounds

This lathe is also for use in tool rooms, and for experimental work, and can be furnished with draw in chuck and collets. Pans are also furnished, to go under full length of lathe bed, when required.

FLATHER & COMPANY

Makers

Nashua - - - New Hampshire

HILL, CLARKE & COMPANY, Agents, Boston, New York, Chicago.

"Shop Talk"

SEVENTH NUMBER OF THE SECOND VOLUME.
JULY, 1902.

Milling Machines, and How to Use Them.

Chapter IV. Manufacturing.

WHEN considering the efficiency of any one department of a manufacturing plant, its relation to all other departments must be taken into account. It is of small profit to have the foundry turn out castings cheaply if they are so poorly moulded that the final cost of the machine is increased, because of increased cost of milling and fitting. On the other hand, if by improved methods the foundry can turn out work cheaply and at the same time so true to pattern that the work in other departments is reduced by reason of foundry efficiency, then the department is entitled to greater credit than appears on the books in reduced cost of castings.

For the moment, our interest is in the

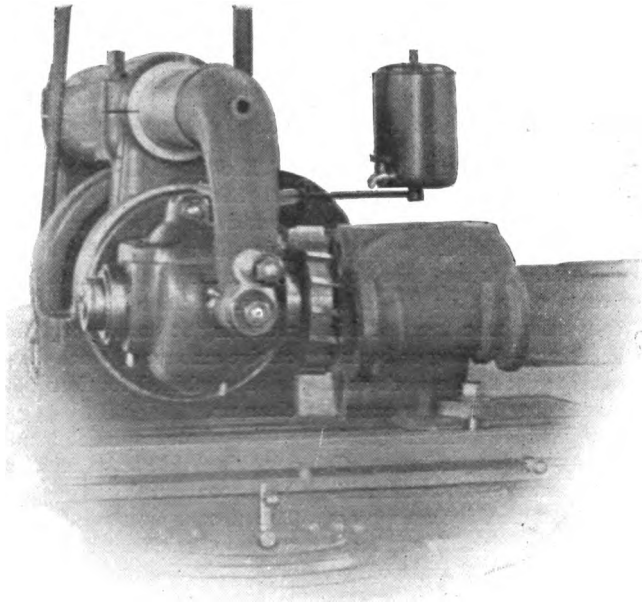


FIG. 1.—FIRST OPERATION—MILLING WATER CYLINDER END.

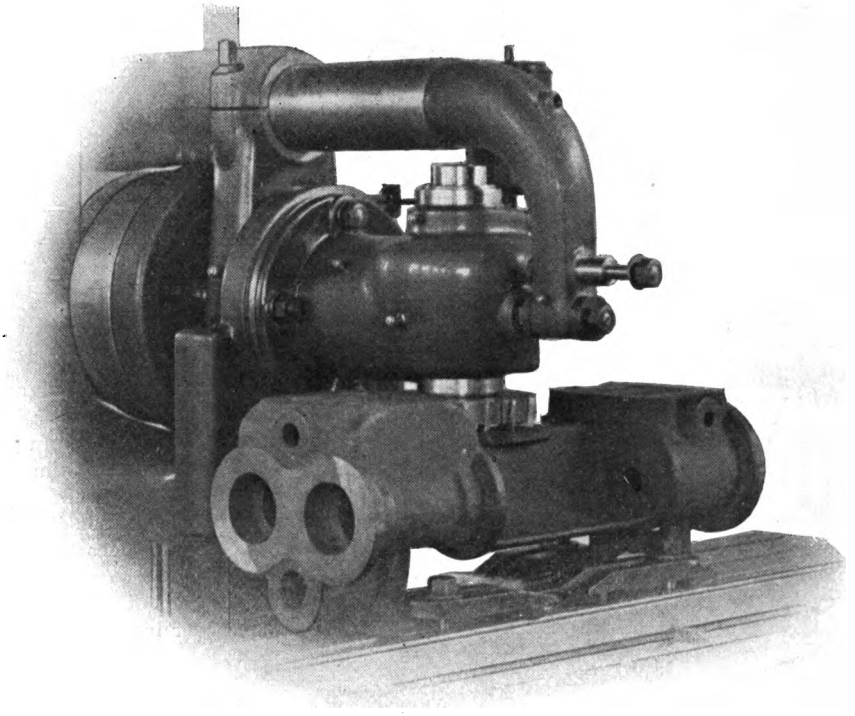


FIG. 2.—THIRD OPERATION—MILLING SPOT FOR CROSS STAND.

milling machine, but it is only by keeping in mind the other departments that its full value can be appreciated. The planer or shaper can produce flat surfaces, and irregular ones also; it may take from 25 to 100 per cent. longer than would be required by the milling machine, but this is not the whole story—drilling or boring jigs must interchange with the work that has preceeded. Fitting is always expensive but if all the parts are interchangeable without doctoring, a great saving is effected, reflecting greater credit on the milling machine that produced it than appears in the reduced cost of production. A case comes to mind where the product of ten fitters was increased 50 per cent. by one operation on a place that had previously been left rough, and this operation was performed by a boy.

Chucking is the first and most important thing to consider in any machine operation. There are on every casting, points from which the piece can be located so that the machined surface will bear the proper relation to the whole casting, rendering it unnecessary to have an excessive amount of stock left on the part to be machined for fear that it will not clean up.

The photographs at hand for illustrating this article serve, as far as the chucking is concerned, only as a bad example. The piece is a casting for a duplex steam pump in which the steam and water ends are cast in one, and it takes only a glance to see how much time could be saved in chucking if a fixture was made that would locate the casting from points that would distribute the inequalities without meas-

uring or blocking. The piece was, however, first milled on the bottom of the feet, an unnecessary operation, as being finished here serves no useful purpose, except to hold the casting in the manner shown.

The cutter was first turned to the right and the cross feed used to mill the water end (Fig. 1). The spindle was then set in a vertical position, the table feed engaged and the valve deck on the water end milled; the cross feed was again engaged and the spot milled for the cross stand bracket (Fig. 2). The cross feed was used because there was not room enough for the cutter to enter between the cylinder ends and the spot. The fourth operation milled the valve seat on the steam end (Fig. 3). Next, the cutter was turned to the left, the cross feed again engaged and the steam cylinder end milled (Fig. 4). The sixth and last operation (Fig. 5), milling the ports, was accomplished by putting an arbor, carrying a gang of cutters, in the taper hole without removing the large end mill.

Many shops manufacturing pumps and engines are squaring (?) the ports by hand. The difference in the quality of the work and the time consumed is so apparent as to require no comment.

The successive milling operations illustrated here were performed on a Milwaukee No. 2 Universal, the only machine of its size on which they could be done, on

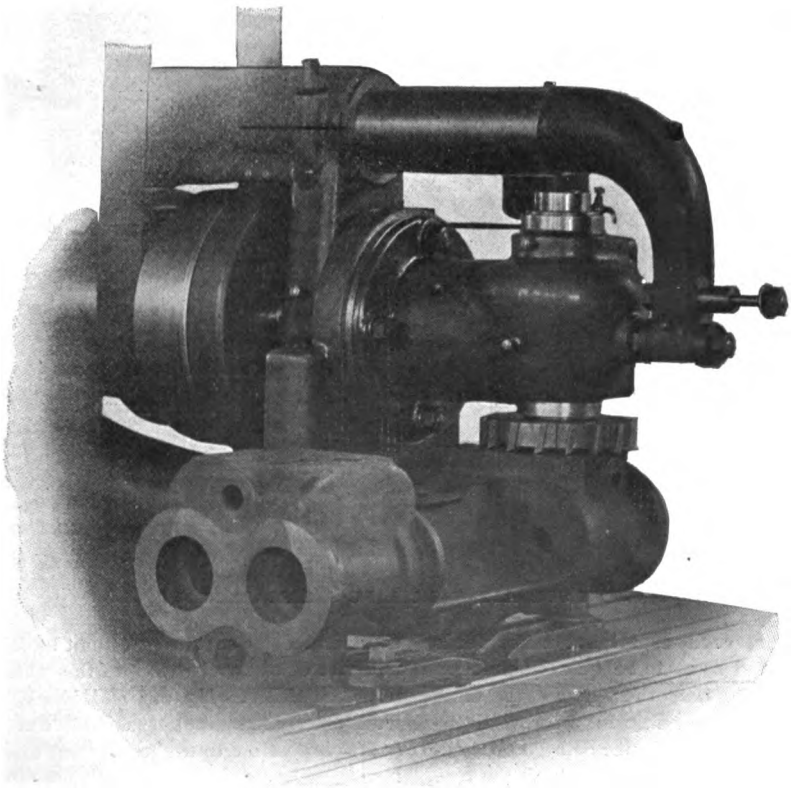


FIG. 3.—FOURTH OPERATION—FACING VALVE SEAT.

account of the heavy Vertical Spindle Attachment and the long automatic cross range.

Formerly it was supposed that a milling machine in the tool room constituted a full equipment in this line of machinery, but lately it is becoming known that improvements have been made greatly increasing the power of the spindle and feed as well as adding innumerable conveniences, such as all automatic feeds constructed so as to be quickly changed from one to the other, and at the same time being impossible for any two to engage at once. The knee being a box section, cast without hole through the top, gives the work table sufficient rigidity to enable it to carry much larger work without chatter than would be possible with the old style construction, and make many manufacturing operations not only possible but economical.

An equipment for the rapid production of finished work on a milling machine can be classified under three heads.

First—Strong, accurate machine with ample range and easy adjustments.

Second—Suitable fixtures for holding the work where the pieces are large or complicated so that they cannot be held in a vise or easily clamped to the table—(it takes skill to lay out and block up work on any machine). A suitable fixture makes it possible to use less skilled workmen.

Third—Well designed cutters, and a good cutter grinder to keep them sharp.

E. J. K.

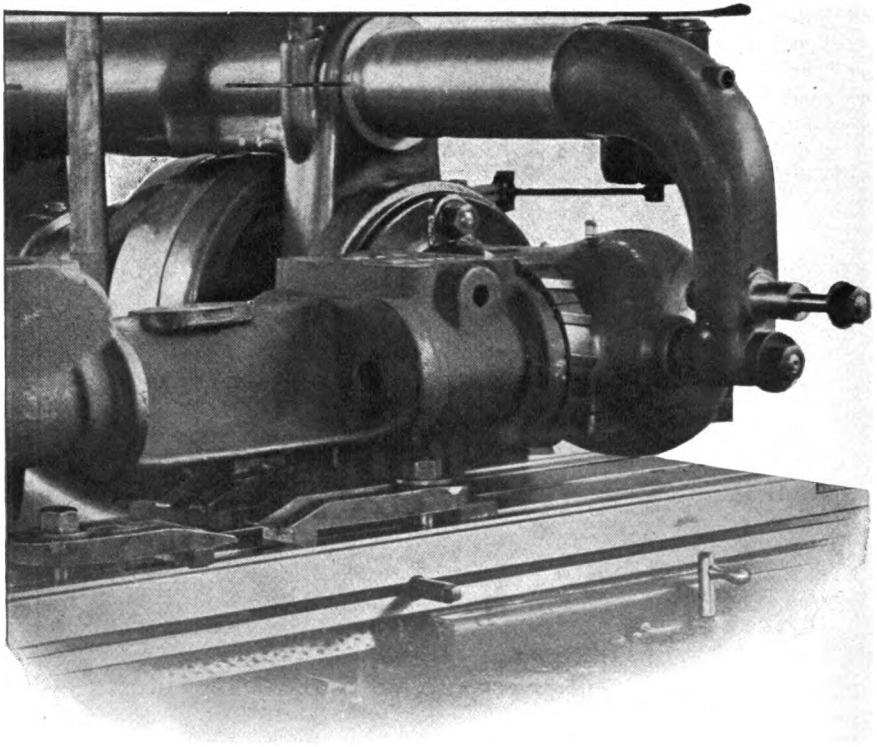


FIG. 4.—FIFTH OPERATION—MILLING STEAM CYLINDER END.

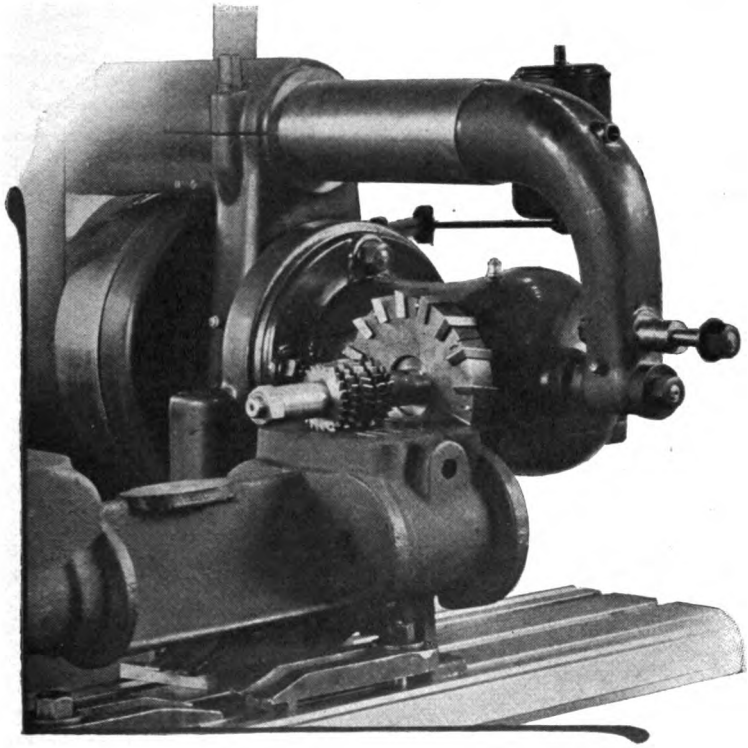


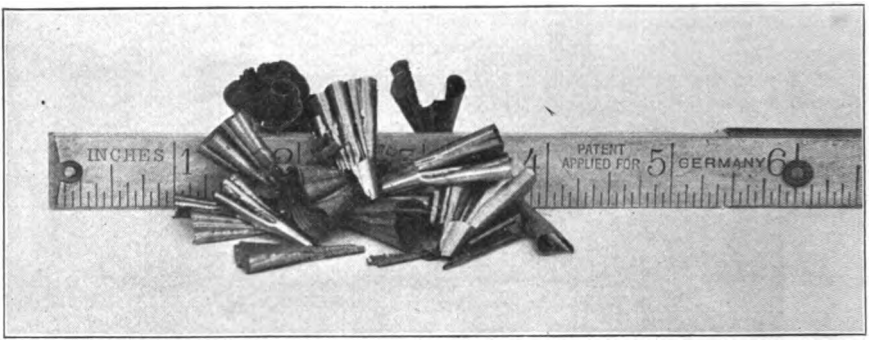
FIG. 5—SIXTH OPERATION—MILLING STEAM AND EXHAUST PORTS.

Something About the "Western" Radial Drill.

JUST a little while ago one of our mechanical engineers took a Western Radial in hand and put it through a variety of drilling operations with a view to testing, somewhat, its rigidity and capacity. The drill showed such remarkable and unusual efficiency that the results are here presented in brief, as testimony to the excellent qualities of the machine.

A regular 5-foot radial was taken in the factory and a 2 7/8" twist drill placed in it. A piece of solid steel was drilled 1/4" first as a leading hole for the larger drill, and this latter then set to work at various speeds. With the drill remaining at rest and not touching the work, a measurement was carefully made of the distance from the base of the machine to the underside of the outer extremity of the drilling arm. This distance was again measured while the drill was working in different positions and at various feeds, and thus a record obtained of the total movement, or take-up, in the arm and column. The following are the amounts of movement detected.

With a 2 7/8" drill, drilling in solid steel, with a leading hole 1/4" diam., the spindle located in the center of the arm and feeding downward at the rate of 160 turns to the inch, or .0063" for every turn of the spindle, the total movement at the end of the arm was .013". Under same con-



STEEL CHIPS WITH $2\frac{7}{16}$" DRILL WITHOUT BACK GEARS IN.

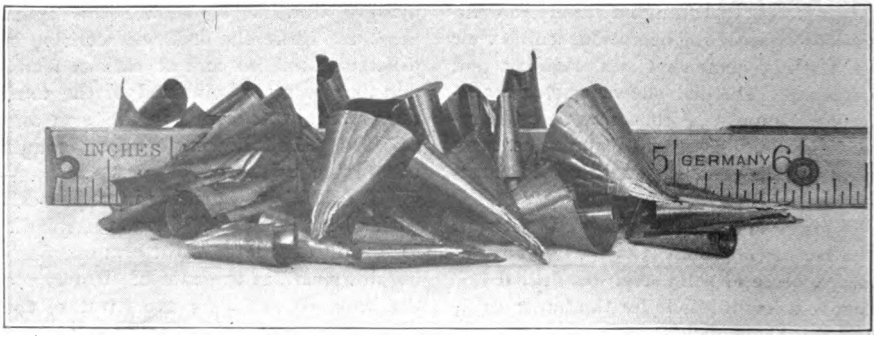
ditions, except with a feed of 1 inch to every 80 turns of the spindle, or .0135" for every turn, the total movement was .037".

The spindle was then set at the outer end of the arm and with the $2\frac{7}{16}$" drill, drilling the same steel, and a feed of 1 inch to every 160 turns, the total movement was .062". With a feed of 1 inch to every 80 turns the total movement was .094".

Note the severity of these latter conditions, the large size of drill, the rapid feed in solid steel, and the location of the spindle at the very extremity of the drilling arm. No such severe test would ever be imposed under practical working conditions. The first case, with the spindle at the middle of the arm, and feeding .0063" to every turn, represents about average working conditions.

The first accompanying illustration shows some chips taken at the time from solid steel with this drill running without the back gears, and with a feed of 1" to 160 turns of the spindle. The second illustration shows chips curled up at the rate of .0135" feed to every turn of the spindle and with the back gears in. Both with the $2\frac{7}{16}$" drill. There seems to be nothing the matter with its pulling capacity, does there?

As we said before, these tests were performed on a regular stock machine, just before shipment to a customer, and with the idea of giving it a thorough trial. We feel that this Western Radial is unexcelled for stiffness, convenience and capacity, and are thus prepared to back up our convictions.



STEEL CHIPS WITH $2\frac{7}{16}$" DRILL WITH BACK GEARS IN.

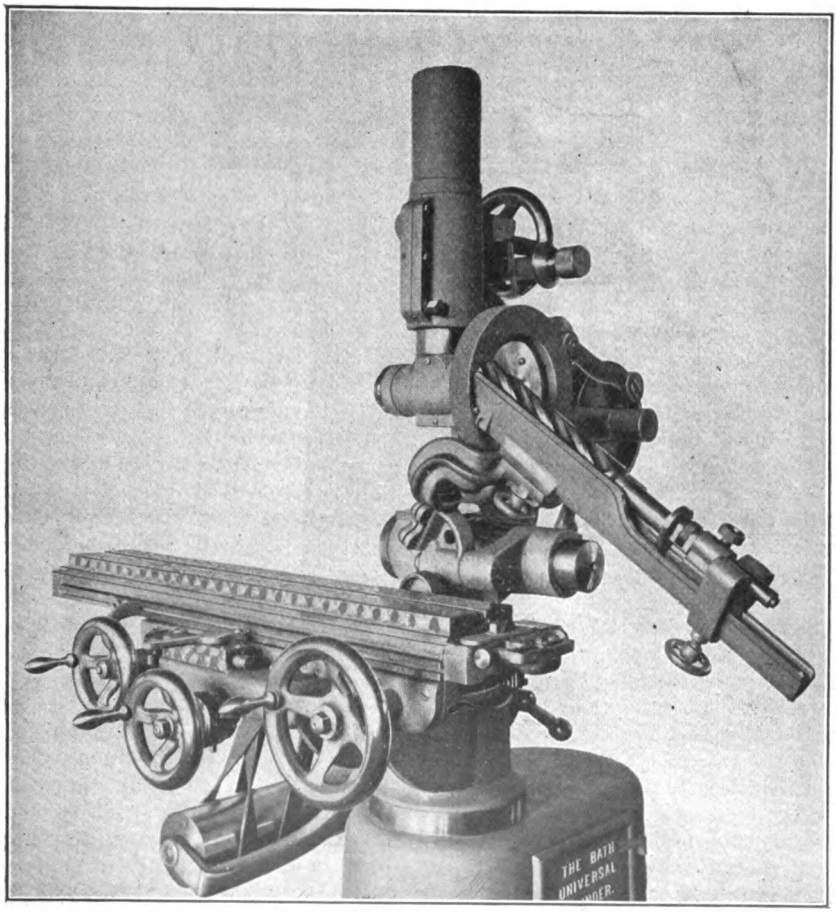
The Bath Grinder Used for Twist Drills.

NE of the great factors of this wonderful machine is that all the detachable parts are interchangeable. Things do not have to go together just as the inventor planned them, but new combinations and adjustments can be made by the user, carrying out ideas of his own.

This cut shows the machine arranged as a twist drill grinder. The holder is put on the same as the other attachments; one advantage of its use being that the vertical adjustment of the wheel enables any portion of its face to be used.

The Bath Grinder has plenty of cast iron in it, has a large capacity, and the proper speed for the use of large and small wheels.

It will grind anything.

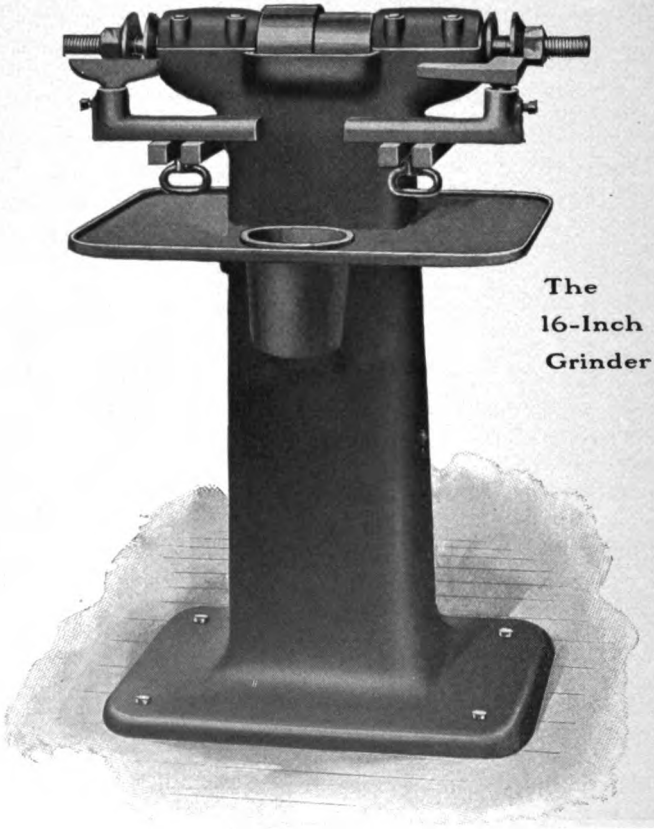


BATH GRINDER WITH "NEW YANKEE" TWIST DRILL HOLDER.

The Next Size.

WE are filling out our line of Chicago Grinders, and next in size after our first one, the 12-inch, comes the 16-inch machine here illustrated. We want you to note the stocky build of this grinder and reflect on what a compact chunk of a machine this is. It's built for business, like all the rest of our tools, and "business" now-a-days means "hustle." This grinder is made to hustle out the work, and keep it up day in, day out for a long, long time, for it's made of all best materials, properly proportioned and machined by modern methods to perfect accuracy.

Except for dimensions, it is built the same as the 12-inch size quite fully described in May and June SHOP TALK. The frame and head are cast all in one piece, the bearings are dirt-proof and self-oiling, and everything is built right and solid. The pan holding the water pot is tightly bolted on, but may be readily removed to accommodate big work.



The 16-Inch Grinder

A two-step cone pulley will give two speeds to maintain the efficiency of the machine after the wheels wear down to small diameter. The work rests are generously proportioned to hold up everything, and are supported by heavy lugs cast with the body of the machine.

The College Man as Leader in the World's Work

BY PROFESSOR R. H. THURSTON, CORNELL UNIVERSITY.

N the twentieth century the college man is, more than ever before, the leader of the world. Mind leads the world; mind ultimately is the ruler of the world. That mind leads the world, which is not simply developed into maximum intellectual perfection; it is that mind which, perfected and strengthened and given symmetry and vigor, is also made most thoroughly at one with the world.

While it is largely true, as has been asserted by more than one such man, like the fox in the fable seeking to justify his amputated tail, that the prizes of our time and our country are now being often grasped by the uncultivated and unlearned man, the fact is mainly due to the circumstances that these men of to-day are mainly uneducated through the misfortune that they were born too soon and before higher education had come to be general and suitable to the conditions of modern life.

In another generation this situation will be modified in the direction of giving these opportunities to educated man in vastly larger proportion. Meantime, every successful man lacking education, learning and culture recognizes to-day either that he has also lacked wisdom if deliberately declining to secure an education when young, or that he has been extremely unfortunate if deprived of that privilege by force of circumstances.

Visiting the famous Homestead Steel Works some years ago, the gentleman who was taking me through the mills pointed out a strong, good-looking and evidently masterly man standing on the top of a set of heavy roll-housings in the armour plate mills, and remarked: "That man is paid more than your college president," and, indicating another who was directing work not far away, and who evidently belonged to the same class, the most intelligent of mechanics, he said: "That man is getting pay exceeding that of any one of your professors."

Both men were soiled and grimy, dressed in overalls and, as occasion arose, ready to take a hand in the work, and, to the unaccustomed eye of the casual visitor, they would seem to be day workmen; but one familiar with such scenes would instantly detect the bearing and manner of the born general, prepared through natural force of character to command.

They were men from the ranks, active, ambitious, good workmen, strong, proud, yet pleasant in their intercourse with all about them, and perfectly well prepared for their places by knowledge, experience and natural fitness.

Why were those skilled mechanics paid the salaries of college presidents and of college professors? The answer is simple: They could make themselves so useful and so necessary in the business that the proprietors could make money by employing them, large as was their compensation.

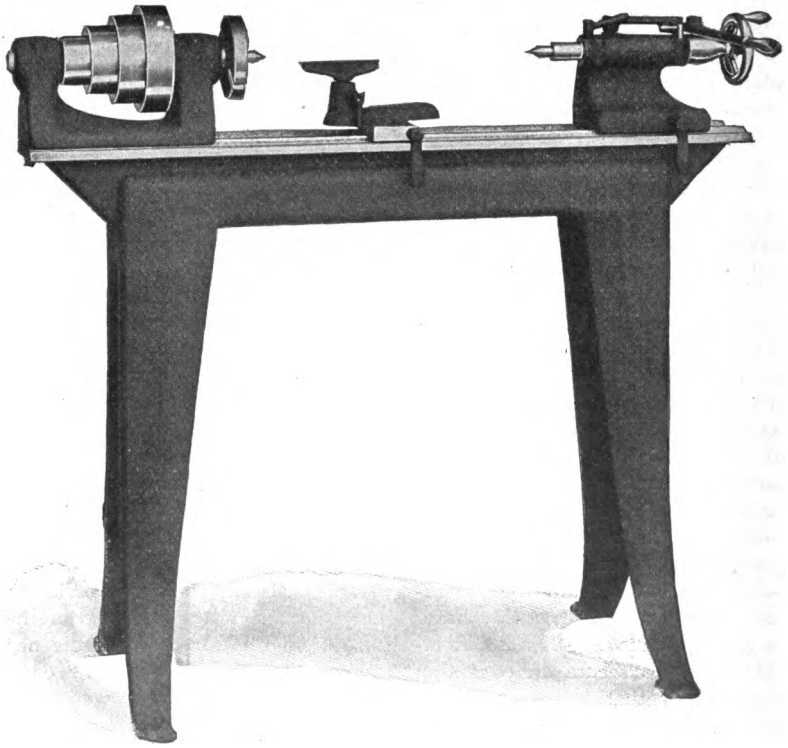
Similarly the great leaders in the industries take a few millions of the many which they earn for the people; it is quite fair.

This is already coming into view as the characteristic change of the time in the making of the personality of the notable man of the time. To-day the educated men are taking their places in the world and their chances of success are and have long been vastly greater in most directions than those of the uneducated.

The proportion of educated men taking their places in history is already fifty times as great as of the uneducated; the next generation will see practically all great prizes in their hands. It is a splendid evidence of the progress of the world that he who chooses may enter the ranks of the educated, and he who will may make himself a man of culture.—*Popular Science Monthly.*

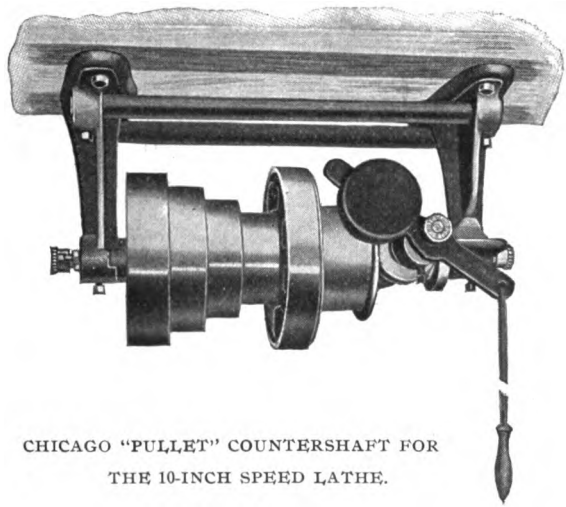
The "Chicago" Speed Lathe.

DID you ever see a more graceful or a better looking speed lathe than this one? Perhaps you have, but we are inclined to doubt it, for we feel sure that this lathe has no equal. Do you say looks don't count? Well, see here—good looks means careful thought, correct design and proper proportion. And looks isn't all there is to this speed lathe either, by a good deal. The bed is of a new shape, extremely stiff, and permits the legs to be close under, instead of having a long span, and thus your floor space is economized.



THE 10-INCH CHICAGO SPEED LATHE.

If you will turn to page 8 of your June SHOP TALK (and you should always keep SHOP TALK where you can easily refer to it) you will find a half-sectional drawing of the same bearing that is embodied in the headstock of this speed lathe. It's neat, dust proof and self-oiling. Think what this means on a speed lathe, the machine that is everybody's business to oil, and on that account the one that nobody actually does oil. We are sure one oiling will last for three months without further attention, and it may go for a year, and even then all that is required is to fill up the oil receptacle again. In our own shop we have set up one of the 12-inch grinders that has this self-oiling bearing, and we purposely put no oil holes in to refill it. We're just going to let it run till it quits—maybe six months, maybe a year; we'll tell you about that later on. But this is digressing.



CHICAGO "PULLET" COUNTERSHAFT FOR THE 10-INCH SPEED LATHE.

Please note that the cone has four steps instead of the customary three, and that it is made for a strong wide belt.

The tailstock is the cut-away pattern, and of excellent design. It is rigidly clamped to the bed by a lever located on its side, instead of by some inconvenient arrangement placed below. It is provided with lever and screw motion, and the change from one to the other is accomplished by merely turning a small pin part way 'round. The lever may be lifted off when desired.

The tool rest is of approved pattern and is also clamped by a small lever on the side.

The finish is the best that can be put on, and this adds the "finishing touch" to the machines that enforces their claim to supreme superiority over all others. Why, the finish is as fine as on the Milwaukee Millers, and you know what that means.

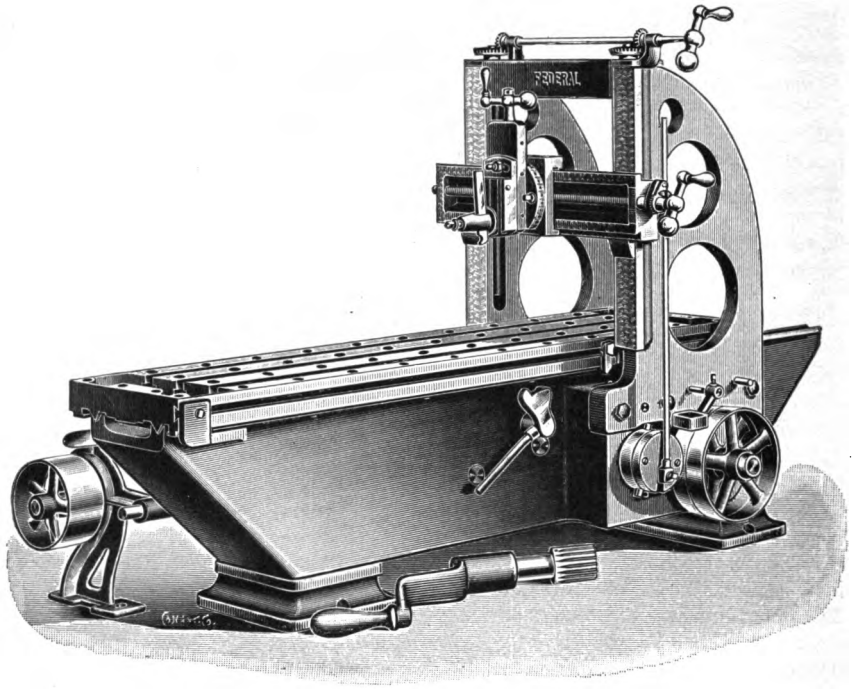
Now for a countershaft to go with these lathes, we have fixed up the neatest little arrangement you ever saw—it's an adaptation of the Chicago countershaft, so that it takes in a four-step cone, and starts or stops with just a pull of the cord, like the other ones built with only one pulley face. It is simple, compact and reliable, easy to put in place and requiring no attention when running. We call it the "Pullet" Countershaft.

This combination of speed lathe and countershaft is unexcelled. It has the regular Hill, Clarke excellence, and doesn't cost much either. Don't you want one?

Bartlett's Bench Planer.

THE Bench Planer shown in the accompanying illustration has recently been brought out by E. E. Bartlett, of Boston, Mass. A smaller size introduced by him some time ago met with such an encouraging reception that this much more substantial and better designed tool has followed as a natural consequence.

The smaller size has found a ready sale in light manufacturing and jobbing shops, but as this new planer weighs nearly double the former one, it will be found far more serviceable for such work. It will plane work 10″ wide, 10″ high and 30′ long. The table, including the pock-



BARTLETT 10-INCH BENCH PLANER.

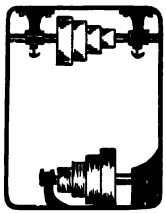
ets is 36" long, and is gibbed down to prevent lifting. It has three T-slots cut from the solid, and four rows of ½" holes drilled and reamed. The machine is driven by two belts, one on each side, operating a train of cut gears, the pinions of which are of steel. The driving pulley is 8" in diameter by 1" face, and the ratio of belt travel to cutting speed is 36 to 1. This is ample to take a ¼" chip from cast iron.

The head has an automatic cross-feed in either direction, has a graduated swivel, and can be set at any angle and locked in the usual way. The screws and shafts are of steel, case hardened wherever advisable, and the handles and balances are of steel, in order to secure the necessary strength with suitable proportions.

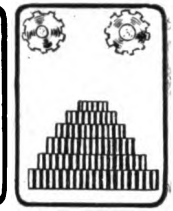
There are a number of features on this machine that are found on large planers, but are not usually incorporated in machines of this size, as, for example. the shifting mechanism of the belts, which motion operates one belt ahead of the other, thus eliminating the dragging and squeaking incident to having two belts on the same pulley at once.

The counter-shaft is fitted with tight and loose pulleys, 5" in diameter, and 2" face, together with two pulleys, one 5" x 2" for driving, and one 8" x 2" for return. The crank handle shown in front is used when the planer is run by hand. This change is easily and quickly made.

The plate glass and window glass factories of the country are virtually all closed under an agreement for a two-months' shut-down. Never before was the glass industry at such a standstill.



EDITORIAL SHOP TALK



N other pages of this issue we are presenting two new machines which are worthy of your attention. They are the Chicago Speed Lathe and the 16-inch Chicago Grinder. Outlined by an experienced mechanical engineer and expert machine designer, drawn up and carefully gone over by a painstaking and clever draftsman, and built under the direct supervision of a skilled mechanic of no mean ability, all these "Chicago" products represent the best practice in design and construction, and embody new points of excellence not found in other machines of their class.

They represent the highest type of machine each in its own field. And why should they not? As the ages go on, each succeeding year brings more improvements and more knowledge gained from time just past. So is it in the field of machine tools. All the good that has been learned from past efforts and designs as well as the education obtained from past failures, is being constantly applied to bring forth new and better things.

This line of Chicago tools is being originated from the ground up. There is no modification of some old pattern spruced up to look like new; they are all new from start to finish, and the experience of years makes them better than the rest.

Read what we have to say about them, for you should reap the benefit of added merit, too. That is what SHOP TALK is for—to tell you of the new and better tools we have and keep you posted regarding our whole line.

The line is large, we've always something new, some fresh machine to place before your view, and if you'll read about them, study o'er their lines, we're sure 'twill aid you to bring better times.

One could hardly call this the dull season could they? Can't say that we've noticed any dullness anyway. People have been buying machinery pretty steadily from us. But that's the way we do business, the same as we advertise,—keep it up, never quit, always having our little say and never dropping off because times happen to be particularly good and we haven't caught up with our orders. That's the kind of advertising we believe in and the kind that pays in the short walk and in the long run. We are right here, always ready to supply your demands when you call upon us in person, by telephone, telegraph or letter. We do business cheerfully, just as we cheerfully answer questions. Let us know when you are next in the market for machine tools and we can no doubt make it advantageous for you to buy of us. Our prices may be a few dollars lower or a few higher, but our machines are built for business and are the kind that save you money in the end.

Mighty as are steam and electricity in the domain of industry, they are but shadows of the mightier power of concentrated thought as expressed in type and spread before the world.—*Edison.*

NEWS & NOTES

NEGOTIATIONS have been finally concluded whereby the Postal Telegraph Company will secure the 3,500 offices and all the lines owned by the Pennsylvania Railroad, now operated by the Western Union. The Postal will take possession of the offices on Jan. 1, when the Western Union will be compelled to give up all of the trunk lines now in use which are on the property of the Pennsylvania Railroad. This deal will deprive the Western Union of its chief outlets west and south, in addition to the 3,500 feeders that cost little or nothing to maintain.

A settlement between the Allis-Chalmers Company and the striking machinists was reached the middle of last month in Chicago after a struggle lasting for more than a year. The agreement provides for an increase of 11 per cent. in wages, no discrimination against strikers, and the nine hour day. They will work fifty-five hours a week, however, but will receive extra pay for this.

A movement has been set on foot in Chicago to build a subway in the downtown district to relieve the congestion of street car travel. Ex-Mayor Hempstead Washburn and Mr. W. A. Alexander are taking the lead toward the organization of the proposed corporation. It is estimated that the cost to construct such a subway would be something like $35,000,000, and the promoters claim that this amount of capital, and even more, will be forthcoming if franchises can be secured from the city government.

Ganz & Co. of Budapest, owners of valuable electric patents and the largest manufacturers of supplies in Europe, are said to have joined the Whitney-Elkins-Ryan-Dolan syndicate, thus forming a tremendous combine.

To successfully compete with the markets of the eastern hemisphere the National Watch Company finds it necessary to erect a four-story addition, estimated to cost $250,000, and to employ 1,500 more men and women. The present working force is 3,000.

It has recently been shown that the United States can operate the fastest long-distance passenger railway trains in the world, by the phenomenal twenty-hour runs between Chicago and New York made on the Lake Shore and Pennsylvania railroads. At the schedule time of twenty hours, the Lake Shore trains make every day an average speed of 49 miles an hour and the Pennsylvania trains 45.6 miles an hour. This average speed is surpassed by some foreign trains, but their runs are only about half the 980 miles by the New York Central and the Lake Shore, and the 912 miles by the Pennsylvania between New York and Chicago.

A new engineering building is to be erected for the University of Michigan in Ann Arbor, Mich., which, when fully equipped, will be one of the most complete of its kind in the United States. It is to cost about $200,000. In the basement will be a testing tank for ships, which will be 300 ft. long, 16 ft. wide and 8 ft. deep. This will be chiefly used by the department of naval architecture, and will be the only one of its kind, outside

of government stations. There is only one in the United States, in the navy yards at Washington, D. C. The tank will also be used for experiments and tests of hydraulic machinery.

Out in Iowa last month, four hundred and forty men working nine hours moved both rails of the Burlington and Western Road on 125 miles of track, and thus broke all records in converting a narrow into a broad gauge track. The work involved the drawing and driving of 200,000 spikes. Each rail was moved ten and a quarter inches to a row of spikes previously driven in the ties. All save four spikes in the inside had been previously drawn, all those on the outside being undisturbed, and over these the rails were lifted to their broader gauge.

It is reported that the largest cotton mill in the world is to be built within twenty miles of Kansas City. Ten million dollars is to be invested, one-third of which has already been subscribed by eastern and western men. The mill will have 500,000 spindles and 12,000 looms, and it will employ 4,000 operatives. The capacity of the mills will be 170,000 bales of cotton a year, with an output of 75,000,000 pounds of finished cloth. The mill will be revolutionary in its construction. Electricity will be used as the motive power and several new devices will be installed. There will be four mill buildings, covering an aggregate of 2,000 acres of ground.

The Illinois Steel Company have recently advanced the wages of all common laborers and a part of the skilled laborers in the Joliet plant. The increase amounts to an average of about 10 per cent. The increase was unexpected by the men, and did not come in response to any request from them. Jones & Laughlins of Pittsburg, have voluntarily advanced the wages of all their employes except the tonnage men. The increase affects over 8,000 men and will average 10 per cent. Laborers who were paid $1.35 will in the future receive $1.50 a day. The furnace employes of the Carnegie Steel Company have also been advanced recently, and it is understood that all of the day laborers in the mills of this company will be treated in a similar manner to those employed by the Jones & Laughlins, limited. The advances have been wholly on account of the general prosperous condition of the steel trade and the increased earning power of the plants.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 18.—Wanted, a first-class all-around machinist, who is a strict mechanic. One familiar with iron pattern work preferred. Is wanted for tool and pattern room. Permanent job for a steady man. Address H. L. L., care of Hill, Clarke & Co., Chicago.

Application No. 37.—Good mechanic, 38 years old, fair draftsman, has had charge of experimental department of small shop for eight years. Has also done installation work in power plants, etc. Wishes to become connected with a larger shop where there is a chance for advancement. Address F. D. care of Hill, Clarke & Co., Chicago.

Application No. 38.—Position wanted as foreman of pattern shop, by married man, 44 years old, 23 years' experience in a variety of work. References. Address H. W. H., care of Hill, Clarke & Co., Chicago.

Application No. 39.—Young man 18 years old, graduates from Manual Training School, and wants position. Will go anywhere, and can furnish references. Address L. S. K., care of Hill, Clarke & Co., Chicago.

Application No. 40.—Young man 20 years old, at present employed as only draughtsman of small concern, wants position with a larger firm where he can work hard and learn to design machinery. Has a good education and some shop experience. Good references as to character, etc. Address R. W. L., care of Hill, Clarke & Co., Chicago.

Application No. 41.—Position wanted as steam engineer by man of 50 who has been in the business for past 20 years. Thirteen years shop experience previously. Has held present position for past 6 years, but wants better place with more pay than $75 a month. Address R. E. G., care of Hill, Clarke & Co., Chicago.

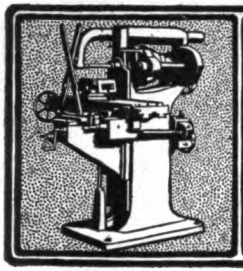
Application No. 42.—Married man of 32, at present holding position as Mechanical Engineer for R. R. Co., wants permanent position with better pay, as Erecting Engineer. Has had plenty of experience and can furnish first-class references. Address R. O. S., care of Hill, Clarke & Co., Chicago.

Application No. 43.—Wanted, position as manager or superintendent of engine or tool works. Age 35. Past ten years in first-class positions. Address H. H. F., care of Hill, Clarke & Co., Chicago.

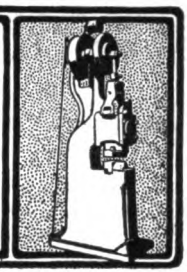
Application No. 44.—Mechanical Engineer, reliable superintendent and shop manager, with practical successful up-to-date machine-shop and foundry experience, executive ability, technical education and good business knowledge, desires responsible leading position with progressive concern—either in works or as selling agent. Is no school boy but of mellow middle age, sober, active, enjoying the best of health. No salary under $3,000 per year considered. Equivalent service guaranteed. High-class references. Address M. E., care of Hill, Clarke & Co., Chicago.

Application No. 45.—Young man, 24, wishes position as Junior Draftsman in Railroad or mechanical shops in Colorado, especially Denver. Experience as machinist in railroad shops and has done tracing, blueprinting, etc. Is now taking correspondence course in mechanical drawing. Temperate habits and is a good stenographer. References. Address W. R. M., Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come to our care will be published free of all charges including correspondence with the interested parties.*



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop, and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

List of Second-Hand Tools in Chicago

SECOND-HAND LATHES

One Fitchburg Lathe. 15"x5'.
One Blaisdell Lathe, 13"x5'.
One 14"x5' Engine Lathe.
One 15"x5' Stud Lathe.
One 14"x6' Flather Lathe, hollow spindle, plain rest, and power cross feed.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One Baush 8 spindle Multiple Drill, circular pattern. For 1" Drills.

SECOND-HAND SCREW MACHINES.

One ½" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No.2 Bardons & Oliver Turret Machine, plain head.

SECOND-HAND CYLINDER BORER.

One Sellers Cylinder Borer, with facing heads. Will bore and face cylinders, 24" diameter and 36" stroke and is in fine condition.

SECOND-HAND PLANERS.

One 22"x22"x5' Whitcomb Planer.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Fisher Boiler-Plate Chipper.
One No. 2½ Pratt & Whitney Cut-off Machine.

New and First-Class Tools in Chicago.

NEW BRAINARD AND OTHER MILLING MACHINES.

Write for Special Circular.

NEW TURRET LATHES.

One Bardons & Oliver No. 15 Brass Lathe, with friction back gears and set over turret.

NEW BORING MILL.

One 37" Baush Boring Mill, double head.

NEW DRILLS

One Foote, Burt & Co.'s 3-spindle, Universal Adjustable Bench Sensitive Drill, automatic feed.
One New 6 spindle Foote, Burt & Co. Multiple Drills. Circular heads. 14" drill circle. Capacity ⅝" drills.

Hill, Clarke & Company,

Machinery Merchants

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance at 153 Greenwich street.

Gas Engine Troubles.

Having had some experience with gas and gasoline engines, a few hints on the subject may prove helpful. The first thing to do when an engine stops is to look after simple things. Don't look for complications until it is necessary. See that the gasoline tank is not empty, even although you may think it is half full. See that the igniter is in proper working order. See that the exhaust valve opens at the right time and does not leak when closed. Sometimes the air valve will stick or not close properly. Overheating often stops an engine, especially when the piston is worn a little. Many an engine stops for want of lubrication. It may get plenty of oil, but not in the right place, and often the oil is the wrong kind. Oil that will stand the highest possible temperature and make the least smoke and soot is what is wanted. Experiments usually are expensive, and the best is none too good when it comes to cylinder oil.

The "jump spark," if properly understood, is by far the best system of ignition, as it is plain and simple, very reliable, easy to set right when wrong, and a good outfit seldom gets wrong, although it is to be remembered that the points should be close together on the sparking plug, as the spark is much hotter and the strain on the insulation is much less, both on coil and plug.

And another thing is to be remembered: that is, if a coil makes a spark one inch long in the air, it will not spurt one-fourth that distance in a compressed mixture of gas and air, and the higher the compression the more it will affect the spark. The insulation from coil to plug must be the best that can be made, for there is where lots of trouble comes from, and either the engine or the coil should have a vibrator, and, if properly made, it will work without fail. An excessively, high compression is not desirable, as what is gained in one way is lost in another.

—H. C. Mueller, in Automobile Review.

Couldn't Sell the Dog's Love.

THE following little incident, clipped from the *Little Chronicle* illustrates how money cannot compensate for real affection.

A gentleman was walking with his little boy at the close of the day, and in passing the cottage of a German laborer the boy's attention was attracted to the dog. It was not a King Charles, nor a black-and-tan, but a common cur. Still the boy took a fancy to him, and wanted his father to buy him.

Just then the owner of the dog came home from his labors and was met by the dog with every demonstration of joy. The gentleman said to the owner:

"My little boy has taken a fancy to your dog, and I will buy him. What do you want for him?"

"I don't can sell dat dog," said the German.

"Look here," said the gentleman, "that is a poor dog, but as my boy wants him, I will give you five dollars for him."

"Yaas," said the German, "I know dat is a very poor dog, and he ain't wort' almost notting, but dere is von leetle ding mit dat dog vat I don't can sell. Dat is der vag of his tail ven I comes home at night."

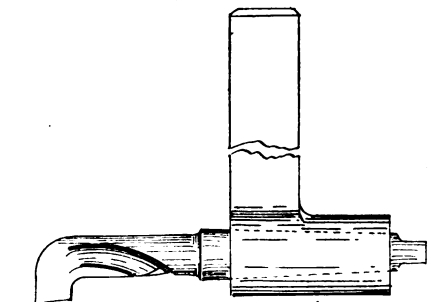
"Shop Talk"

EIGHTH NUMBER OF THE SECOND VOLUME.
AUGUST, 1902.

A Novel Use for Worn-out Twist Drills.

KEEP your worn-out or broken twist drills; it is surprising how useful they may be at times. The accompanying illustration shows one use to which they can be put, and needs, I think, little explanation. Figure 1 shows a holder to fix in the planer or shaper tool post, made from a forging. The hole through the boss is bored to No. 1, No. 2, No. 3 or No. 4 Morse Taper as the case may be. The twist drills may be forged to the shape shown. Figure 2 is a front view of the apparatus. In Figure 3 is shown a special tool bar, to fit tools of round section steel. A flat is filed on the tool bits to prevent them from twining when held by the set screw.

Soften all the odd, broken, etc., drills down and keep them for making end mills, counterbores, small slot mills. They can be turned up, driven into a socket which fits the lathe spindle center hole, and teeth may be either filed on or milled. They may be made into cutters for milling odd shapes by simply flattening the ends like a flat drill and filing up to any desired shape. With such two-edged cutters I have fluted taps, reamers, etc., in the lathe; with small end slot mills have milled out I slots and narrow surfaces on small articles in much quicker time than would be taken on the shaper.



FRANCIS W. SHAW.

Birmingham, Eng.

A Radically Right Radial.

THE "Western" Universal Radial Drill here shown is the latest and most improved form of this machine. It is a fully universal drill, retaining all the stiffness of a plain radial, and yet possessing adjustments by which it will drill a hole in any possible angle or direction.

The column is double to the top; is circular in section, the best form to obtain stiffness, and swings completely around upon anti-friction bearings top and bottom. By throwing over the hand lever at the base, the column is clamped in position with sufficient rigidity for all vertical drilling. Bolts for clamping the base provide an additional safeguard to be used in horizontal drilling.

The arm is a half circular section, heavily webbed and braced, with a very wide face on which is mounted the drill carriage. Both the arm and drill carriage swivel completely round and are graduated in degrees. The machine end of the arm is hobbed out and swivelled by a wrench. The head is also swivelled with a wrench by means of a pinion and the toothed arc shown in the illustration. This way both swivelling adjustments can be accurately and easily made. Back gears are located in the base of the arm and operate direct on the driving shaft as close to the spindle as possible. The back gears and all gears from there to the spindle are of steel.

Instead of a stepped cone and shifting belt, the speed is controlled by a Reeves variable speed transmission, which in the case of an electrically driven radial, is mounted in a cradle at the top of the column and connected by sprockets and a chain to a crank, attached to the side of the column.

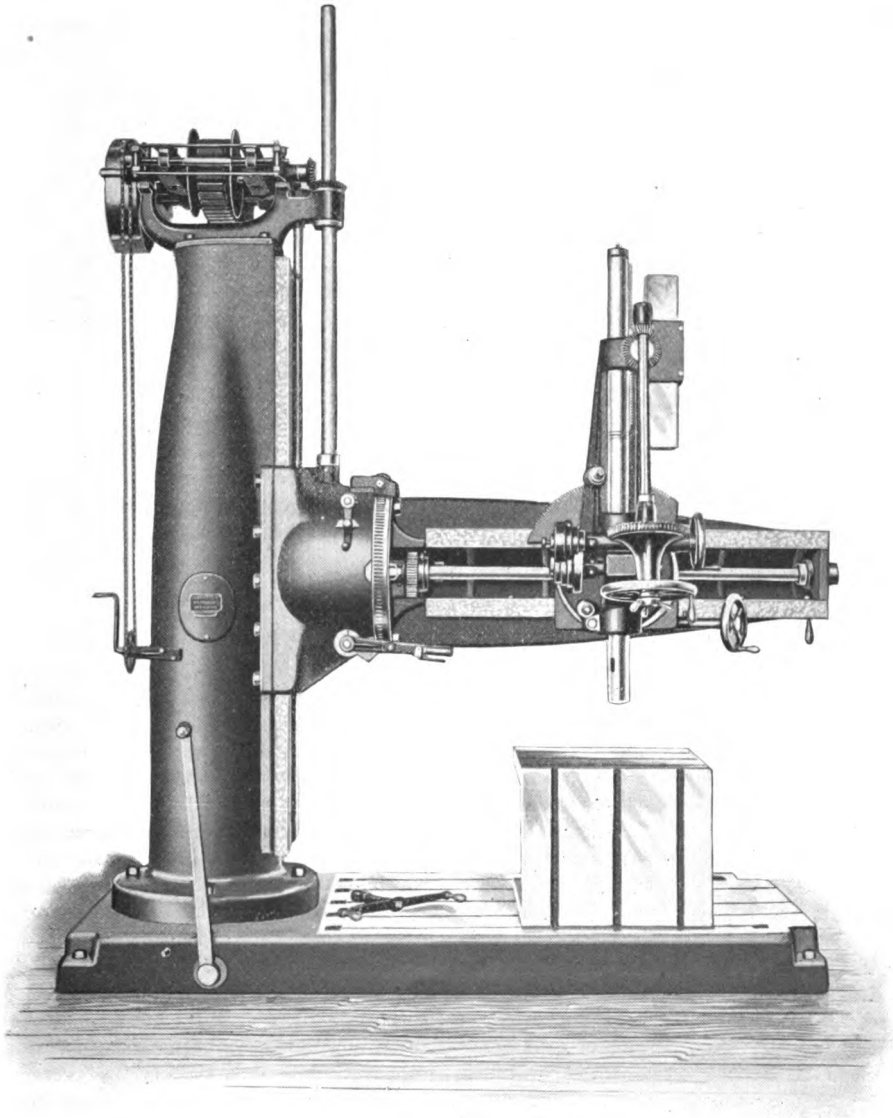
A constant speed motor is attached to the back of the column, high enough from the floor to avoid injury from castings piled around the machine, and belted to the pulley on the variable speed transmission, through which motion is transmitted through bevel gears to the spindle. With this method of changing speed, the range of the drill is greatly increased and any speed is instantly obtainable. A continuous range of speeds from the slowest to the fastest can be had, so that any size of drill can be worked most advantageously in the metal at hand.

If it is desired to use a belt drive from a line shaft, the Reeves transmission is fitted with a friction clutch pulley and bolted to the ceiling over the drill column. The power is brought to the top of the drill by means of a vertical shaft with universal connections.

The drive is the most direct of any radial made, no power being eaten up by a mass of gearing. The power is applied to the spindle *on its large diameter* and *near its lower end*, instead of up high on a small diameter where there would be opportunity for strain and twist with heavy work. This is a feature not found upon any other machine, and in part accounts for the heavy work that is constantly being done on the "Western." We have known a 5-foot machine, such as is shown here, to pull a 3⅛ inch drill in steel with a small leading hole.

The three regular automatic feeds, such as are recommended by twist drill manufacturers, are provided, and there is also a fourth feed which moves the spindle very rapidly, for boring or reaming. These feeds are changed from one to another by a sliding key located on the head. When the handle is pushed clear in, the automatic feed mechanism is disconnected and a hand screw feed is obtainable by the hand wheel shown at the right of the head. The spindle has a quick return which moves at a very rapid rate, and is also used for tapping.

A tapping attachment is provided on all drills and is located in the base of the arm



120-inch "Western" Universal Radial Drill.

See page 4.

where the vertical driving shaft comes through the arm, so that the power is least where the clutch is applied, making it possible to use a very simple mechanism and one that can be started, reversed or stopped with ease even when the heaviest tap is at work. The lever for operating the tapping attachment extends out along the arm, and is in easy reach of the operator at all positions of the spindle. In fact, a man standing at the front of the machine can control every operation. When the tapping lever is at the central position, the machine is stopped and all gears are stationary, except those at the top of the column. By a new device the tapping attachment also serves to control the power raising and lowering device of the arm. This lever also starts and stops the spindle when drilling, and thus a multiplicity of gears is done away with. Starting and stopping is done without any jar or shock.

The spindle is counterbalanced by a new arrangement, which consists of a balance-weight running in a slide, and having a rack cut in its side which meshes into the feed pinion. By this method of balancing the spindle is in accurate balance at any possible angle. The spindle might be completely reversed and a hole drilled straight upward with the spindle balanced at all times.

The head is moved along the arm by a hand wheel and spiral pinion meshing into a rack. The table furnished with all machines is large and heavy, with "T" slots on two sides, and being planed square on all six sides, can be used in any position. The base is extra large, very rigid, and provided with long "T" slots.

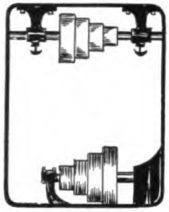
All gears except one or two where very little power is required, are made of steel.

The July SHOP TALK gave on pages 7 and 8, an idea of the stiffness and capacity of the 5-foot drill, an in addition to these two most desirable qualifications, this Western Radial embodies great convenience and reliability of operation. It is a radically right radial.

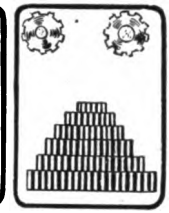
What a Car Wheel Must Stand.

AS an example of the founders' art the cast-iron chilled carwheel is undoubtedly without a peer among all other classes of cast-iron work when all the conditions necessary to its success are considered. A carwheel must stand certain prescribed tests formulated by the Master Mechanics' Association in order to be accepted by the railroad purchasing agents. One wheel from each one hundred wheels must be subjected to the drop test, in which a certain weight falling from a height is allowed to strike the hub of the wheel while the rim is supported on three points. Another wheel is subjected to the thermal test, which is performed by bedding the wheel in molding sand, leaving a space around the tread and pouring molten iron around it. The result is that the outer portion is suddenly expanded, and, unless of the best grade of metal, the wheel flies to pieces. The first test is to try the wheel for its ability to stand the shocks of service and the thermal test is to determine its ability to stand long continued brake shoe pressure, as is necessary on long grades. Carwheels also have to meet certain requirements as to depth and quality of the chilled tread. After meeting all these requirements, the carwheel maker is enabled to command a price for standard wheels of only about one cent per pound, making the average price per wheel from $6 to $7.—*Machinery.*

The International Harvester Company, with an authorized capital of $120,000,000, has recently been organized at Trenton, N. J. The company is authorized to manufacture harvesting machines and agricultural implements of all kinds. It is stated that among the concerns interested in the syndicate are the McCormick reaper and mower concern and the Deering people of Chicago.



EDITORIAL SHOP TALK



THE month of July saw the termination of the first year the Bath Grinder was placed upon the market, and looking back over this comparatively short life of an entirely new machine, we find that it has made a phenomenal record for itself, or rather that we have made the record for it. During that period, fifty-one Bath Grinders have been sold, practically one a week, and this in spite of the constantly increased price of the machine, its greater cost than any other, and the fact that it was as yet comparatively untried by the machinery public in general. The explanation lies merely in its absolute superiority over all others. It has occurred in large manufacturing concerns where there were already four standard makes of grinding machines, supposed at least, in the aggregate, of being capable of grinding all tools which might be made or used, that the Bath Universal Grinder has been bought in addition in order that grinding might be done upon it that had been impossible to do upon the others. This is an unusual state of affairs for any machine. Any manufacturer of machine tools who has had experience in introducing new machines cannot help but appreciate what a phenomenal sale this grinder has experienced. One a week for the entire first year of its introduction upon the market!

In developing new types of machine tools, or in improving upon older patterns, we keep constantly in mind that increased capacity and output ranks next in importance, or perhaps equally, with accuracy and reliability. To enable manufacturers to produce the most in the shortest time and do it well is our constant endeavor. In a sense, we make a specialty of machinery for reducing cost of production, or increasing the output of all articles that are manufactured in large quantities. Even where manufacturers have supposed that they were turning out work at the lowest possible labor cost, we have accomplished surprising results. A long experience along this line enables us to think out problems that perhaps are quite severe for one who has worked only in a few lines, and so we would suggest that you write to us regarding the work you now are doing, so that we may help you to do it better, cheaper and in greater quantity.

Opportunity.

Master of human destinies am I!
Fame, love and fortune on my footsteps wait.
Cities and fields I walk. I penetrate
Deserts and seas remote, and passing by
Hovel and mart and palace, soon or late
I knock unbidden once at every gate!
If sleeping, wake; if feasting rise before
I turn away. It is the hour of fate,
And they who follow me reach every state
Mortals desire, and conquer every foe
Save death, but those who doubt or hesitate
Condemned to failure, penury and woe.
Seek me in vain and uselessly implore
I answer not, and I return no more.

JOHN J. INGALLS.

How To Cut Down Expenses.

HOW to reduce cost of production? That is the problem for any one operating any sort of shop or establishment. Here's a way that will do for some—get a Multiple Drill from us such as is shown on page 9.

This machine not only saves time by drilling a number of holes at once, but saves a great deal of time in not having to move the work from one hole to another. It also saves all the time of clamping the work to the table, necessary with a single spindle drill, but not necessary with a multiple, as one drill balances another.

Spindles are adjustable in the head, and are instantly clamped by tightening one nut; each is fitted with ball-thrust bearings and hardened steel collars. A guide plate is used for supporting the spindles.

Vertical adjustment is provided independently for each drill, so that all can be made to strike the work alike. The head has an automatic feed, with quick return, and is balanced by a counterweight inside the column. The counterweight pulleys have roller bearings. The rack for operating the feed to the head is of steel with cut teeth and the pinion in the head which meshes with this rack is also of steel, made solid with its shaft. No danger of breaking under severest strains.

The feed apparatus can be thrown in or out with the slightest exertion, even while the drill is working at its fullest capacity. An automatic knockout is also provided.

There are no large gears in this machine so that it runs noiselessly and at a high speed. What gears there are, are inside the head and are of steel, the smaller ones of tool steel. The drill has a separate countershaft so does not have to be set directly under the main line shaft.

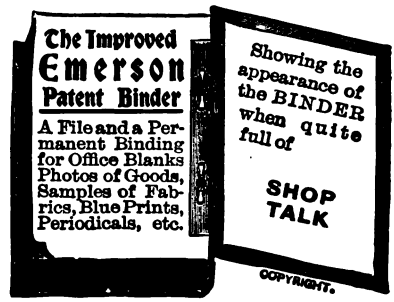
It is heavily double back geared inside the head, so that it is of ample power for the severest classes of work. Six, eight, ten or twelve spindles can be provided, and arranged to drill holes close together to suit special work.

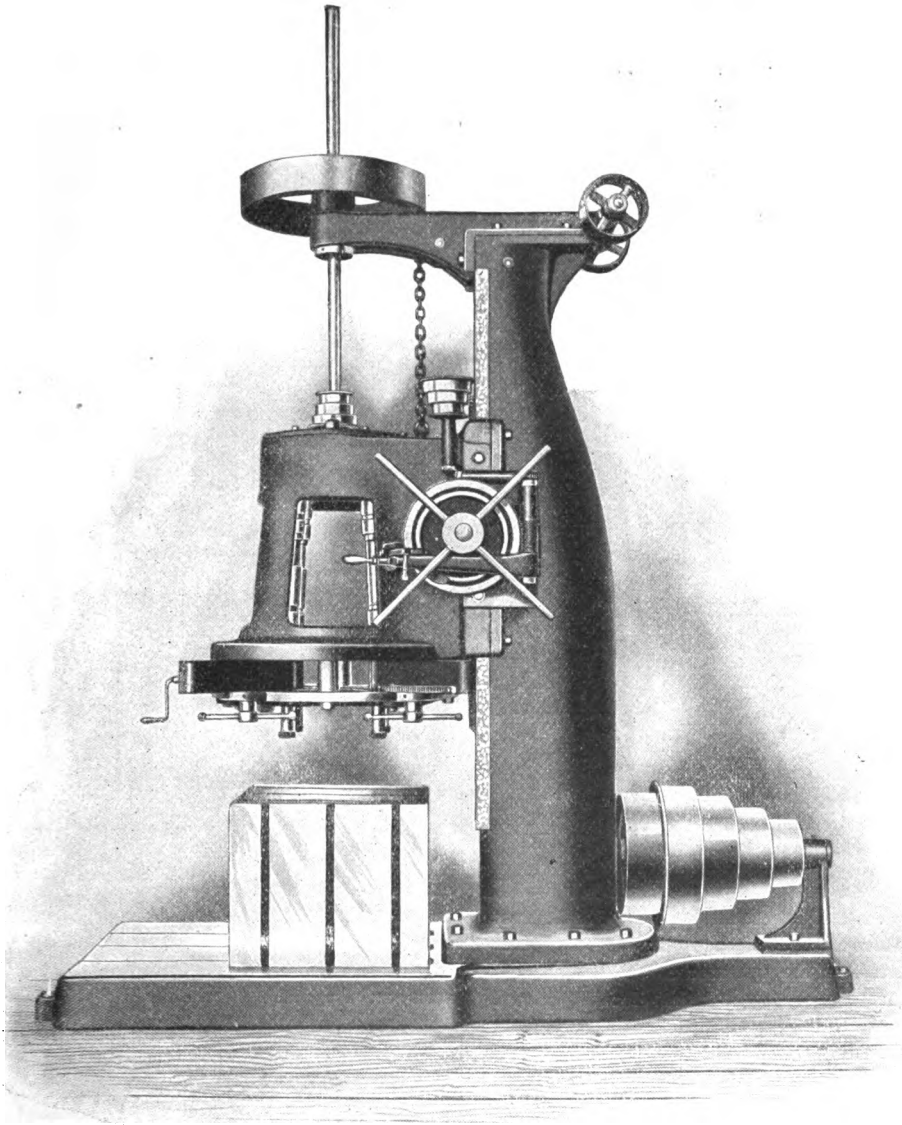
On the machine here shown, a universal attachment to the spindles has been added just below the guide plate, so that by turning the small handle shown at the left, all the spindles are run in and out from the center simultaneously. This is a very rapid and accurate method of setting them but is an attachment only provided upon special specification.

The machine is of a heavy pattern throughout, designed for heavy work, and will be found particularly useful for drilling holes in steam engine cylinders, steam chests, and flanges of valves, fittings, etc.

A First Rate Binder For Shop Talk.

IN order that copies of SHOP TALK may be properly preserved and readily kept on hand in convenient form, we have arranged with the Barrett Bindery, 180 Monroe street, Chicago, to supply to our readers an Emerson binder, as here shown, at a cost of 50 cents, by mail, prepaid. This is just suited in size, is extremely simple and convenient to use, taking no time at all to put a new number in, and has the title "Shop Talk" printed in gilt upon the cover.





No. 3A Multiple Drill.

See page 8.

An Easy Method of Holding Shafts Square for Centering.

IN ORDER to make it an easy matter to set shafts and rods square in the drill press for centering them, without loss of time, I had two clamps made of ½ inch by 2½ inch machine steel as shown in Fig. I. The method of using same being shown in Fig. III.

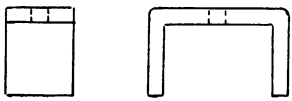


Fig. I

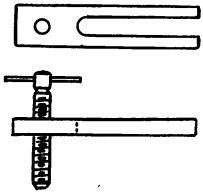


Fig. II.

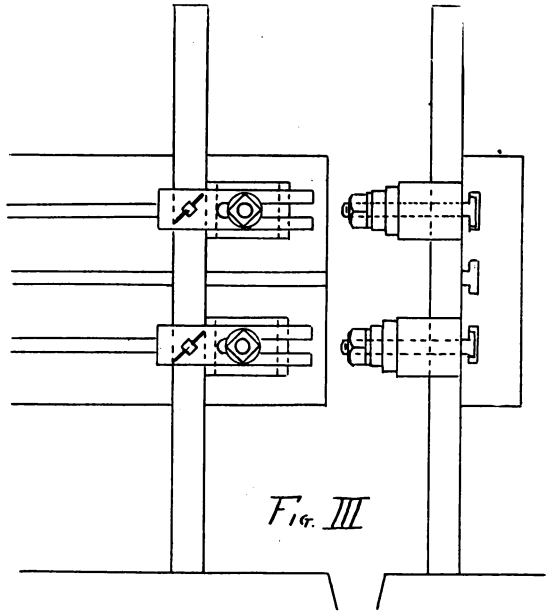


Fig. III

The two clamps were set in position with a square from the base of drill press, then clamped firmly. It was only necessary for the operator to set the shaft to be centered against the clamps, (Fig. 1) and then by tightening the two hand screws, which are merely set screws with ¼-inch pins driven into the heads, all was ready, the operation of setting the shaft or rod requiring but a few seconds.

The drill press on which the centering was done was of a type where the table could be set at right angles to thehorizontal. The two pieces Fig. II. were made of ¾-inch by 2-inch machine steel, and as will be readily seen, were tapped to receive the clamping screws, and slotted for adjustment to suit the various diameters of stock to be centered. The nuts in Fig. III. were simply square nuts faced on both sides.

ROBERT A. LACHMANN.

Chicago, Ills.

A Universal Holder that is Universal.

THE Complete Universal Holder that is made by the same concern that build the Bath Grinder, is a combination that completely defines the word "universal". Figure 1 is the complete set for holding any shape or kind of work and adjusting it to various positions, of knowable amounts and directions.

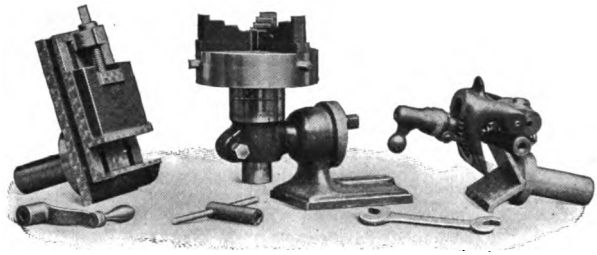


FIG. 1. A SET OF UNIVERSAL HOLDERS.

How many times has a machinist had his patience tested, trying to hold some irregular piece at an odd angle to get some miserable little hole in it that the draftsman put there. This arrangement will hold any kind of a thing right where it is wanted, and without loss of time by fussing and fixing.

In Figure 2 a quill shaft is being held to have a small hole drilled in its end. By reversing the swivel of the holder the other end is drilled in the same line.

Just this brief glance at what it here holds must convey an idea of the infinite variety of positions and uses in which it may be used. Can't you save lots of time in your shop with this set? Pays for itself in a short time in wages saved, to say nothing of the bother.

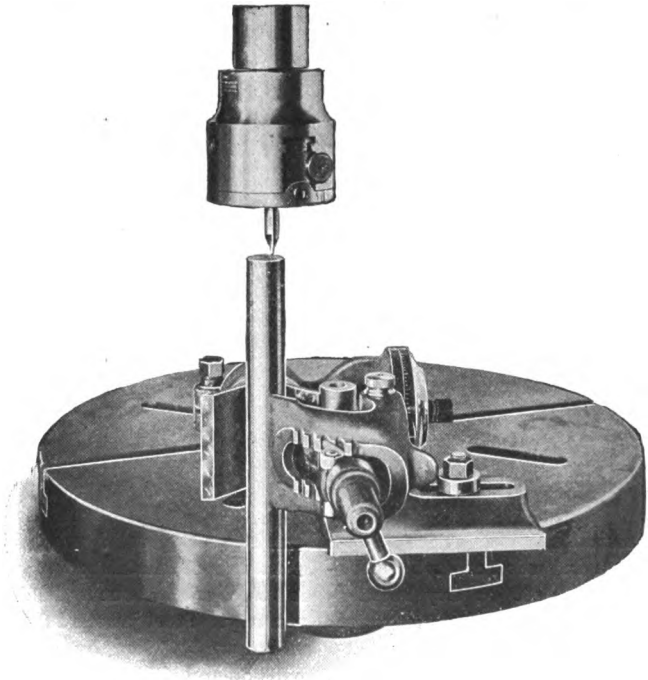


FIG. 2. HOLDING A QUILL SHAFT.

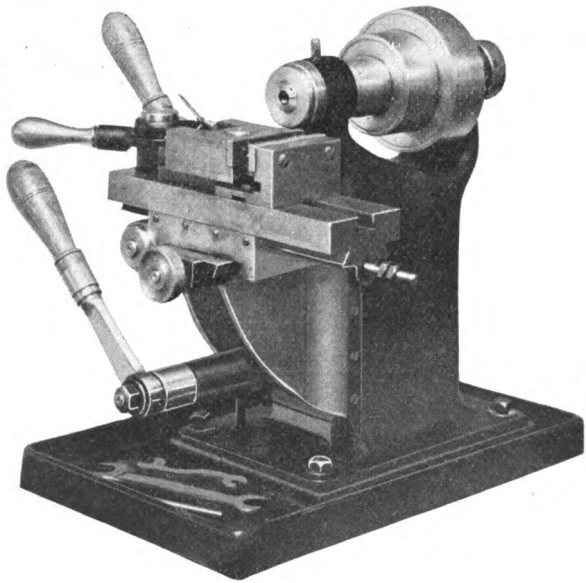
That Bench Milling Machine.

UR bench hand miller has recently attracted so much attention by reason of the surprising amount of work it will turn out, that we give here a brief description of it and show two views of this little machine.

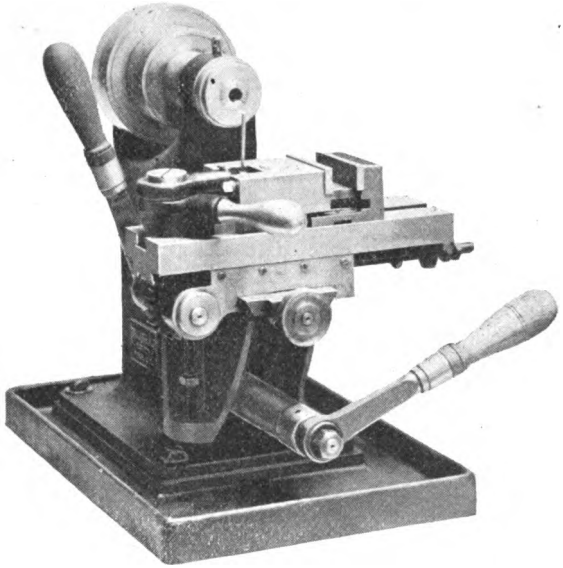
It is especially designed for that class of light work which is turned out in large quantities by makers of guns, sewing machines, type-writers, electrical work, and many other manufacturers. It is also designed with the intention of saving floor space, and can be set on any regular bench. If a number of them are to be used they can be set on a bench or platform which will take up very little room. In building it, the same pains have been taken with the fittings and alignments as with any larger miller, and we intend to have the machine accurate and right in every particular. The usual rack and pinion are used for both the vertical and horizontal feeds, and these feeds are operated by hand levers. The solid cutters used in this machine are held in a draw back collet, and one collet of this description with ½" hole is furnished with each machine.

A cutter arbor to use in the place of the collet, or in addition to the collet, can be furnished, if required.

The vise furnished is operated by a lever which is entirely different from the regular milling machine vise, but we think this vise, after a fair trial, will speak for itself, as it is easily adjusted and is also operated much quicker than with the old fashioned screw, and there is no question about its holding the work securely. Steel jaws are fitted to the vise which are 3¼" long by 1 3-16" deep, and will open 1 5-16". The cast iron base holding chips and oil is a convenient addition.



At present we are just about to bring out two larger sizes of this hand milling machine, one for the bench and one on a column. These will be equal in every way to the smaller size, and will have of course much greater capacity. We will



be glad to send information regarding these latter styles to interested parties or prospective buyers, and judging from the many friends the little fellow has made by its serviceability, we shall expect a big demand for larger ones.

Special Machines for Accurate Work on Dies.

BY "TUBAL-CAIN".

IT MUST be gratifying to mechanics who are interested in the cheap and accurate production of metal parts to note the wonderful progress that has been made in the use of the power press during the last few years. In fact, the time has arrived when this modern machine tool has demonstrated its efficiency, when used in conjunction with suitable dies and fixtures, for producing parts of steel, iron and other metals at a lower cost to the manufacturer and to a finer degree of interchangeability than it has been possible to attain by other means. Where the power press has been adopted for the production of metal parts, and where the full value of dies is understood and appreciated, the machines in which they are used have become as important factors in production as any of the other machine tools in general use. The only reason for their non-adoption in a large number of other establishments is that their use is not understood. There are a great number of shops, both large and small, in which duplicate small parts of standard shapes and sizes are being constantly made, by milling, drilling, filing or other means, that could be produced at a greatly reduced cost and to a higher degree of accuracy by means of suitable dies in the foot or power press. In such shops, the use of the product of dies, that is, using sheet metal blanks instead of castings where practicable, would cause the people who are responsible for results in such shops to first open their eyes and later to double their production and profits.

While numbers of special machines and

devices have been invented for the making of all kinds of other tools, hand work, to a greater or less degree, has been depended upon for the making of dies, from simple blanking dies to intricate drawing and forming combinations of tools. The advent of the vertical attachment for the universal milling machine helped some, but what he wanted was a machine which would do the work which it was then only possible to accomplish by the hand of a skilled mechanic with a file. Thus, to a certain extent, the use of dies has been prevented by the expense which would be incurred in the making of them. This excuse, however, is now no longer operative, for there are now machines which will do the work on dies formerly only possible by hand labor. We refer to the various die shaping and milling machines which are now on the market.

The value of these machines to all concerns in which many dies are made, may be judged from Figure 1, in which are shown a number of dies of different types which were machined and finished, up to the point of hardening, by the use of a die milling machine. Every die-maker knows the skill necessary for finishing such dies by hand, especially in giving the proper or required degree of clearance all the way through. By the use of machines of the type mentioned above, this can be accomplished with ease, and dies which are required to be finished straight, or tapered slightly inward, as is necessary in burnishing dies, may be finished with no more trouble than would be involved in the finishing of a die with excess clearance.

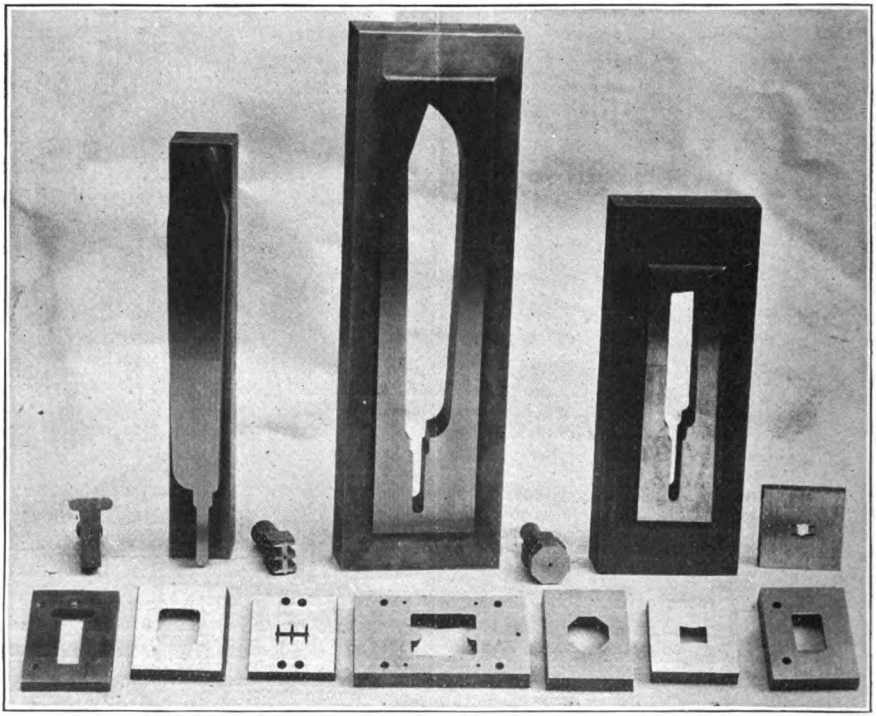


FIG. 1. A NUMBER OF DIES MADE ON A DIE MILLING MACHINE.

The die milling machine may be used for roughing out and finishing to within a thousandth of an inch or so of the tem-

plet lines, any kind of blanking, trimming or punching dies, such as are required to produce silverware, jewelry, bicycle parts, drop forgings, typewriter parts, sewing machine parts, etc.

A type of die milling machine now in use in a number of die shops is so constructed that the frame of the machine is supported on trunions or gudgeons, which hold it in any desired position, that the operator may have the best possible light on the surface of the work. The spindle is perpendicular to the machine face and is adjustable. When arranged for milling blanking dies the cutter projects through an opening in the chuck, in which the work is clamped, and is straight or tapered to suit the amount of clearance required in the die. When such machines are used it is only necessary to drill one hole through the die blank, and the cutter, starting in this hole and following the outline of the templet, removes the entire center in a single piece. The chuck, or work holder, on such machines is moved in either direction by means of two slides at right angles, and by the use of hand wheels on the feed screws, the outlines of the templet on the surface of the work are accurately followed. To assist in doing this there is a pointer at the right of the work which remains at a fixed position with reference to the cutter when the latter is below the surface of the work, and indicates its exact position. This is convenient in cases where a sharp corner is to be made, when the cutter can be lowered and the cutting continued, guided by the pointer, thus leaving very little to be filed.

Although die milling machines are not built usually to take very large work, they will take blanks or forgings up to ten inches wide by two inches thick, and any length.

In connection with machines for die making, a die sinking attachment may be used, and as a great number of dies are required to be sunk, one of them is worth having. By the use of the die sinking attachment, the skill and knowledge necesssary to the successful use of small chisels, gravers, riffles, and other tools of the hand die-sinker are not absolutely necessary, and a good die-maker will have no difficulty in doing the best work in this line. As these attachments can be attached to die milling machines in a few minutes, the machine is converted into a die sinking machine.

In the shop with which the writer is connected they have also a special machine for filing the dies worked out in the die milling machine. This machine is used for filing to a finish all kinds of blanking, trimming, punching and irregular or square shaped drawing dies, or anything of that kind that has to be filed accurately. By adjusting the table of this machine to a graduated plate, any desired clearance from one to ten degrees can be obtained. By setting the machine at zero the walls of a drawing die, a burnishing die, or an accurate trimming die can be filed or lapped perfectly square, something that is impossible by hand, even by the most skillful die-maker. In these filing machines care must always be taken to have the upper end of the file supported by adjusting a rest provided for that purpose. The amount of stroke in machines of this kind can be readily adjusted by a slot-headed screw in the driving disc, carrying it further from or closer to the center, as the work may require. For fine filing a short stroke is desirable.

The samples of die work shown in Figure 1 are only a few of the large variety of dies which can be finished in half the time and at half the expense usually required when other means are used. Although it is a fact that skillful workmen can often accomplish the most astonishing results with tools which are far from being what they should be, an equipment of up-to-date tools is always to be desired in any line of mechanical work.

NEWS & NOTES

STRIKES of all natures are prevalent all over the country, and it is a noticeable fact that in almost all instances, both sides are so anxious for prompt settlement of their difficulties that they will allow their grievances to be placed in the hands of arbitration committies to attain that end at the earliest possible moment. Notices in the daily press of strike declarations are immediately followed by further announcements of amicable settlement in most instances. The great corporations and powerful monopolies still stand out for what they term their rights, but small firms and all those of good business judgment are wide awake to the superiority of arbitration.

According to the report of the bureau of statistics for the twelve months ending June 30, 1902, there has been a decided falling off in the sale of American locomotives, especially in European countries. The high-water mark in the export of this class of manufactures was reached in 1900, when the figures for the fiscal year were 525 locomotives, valued at $5,592,403. During the year just closed the number dropped 365 and the value to $3,257,894.

The commissioner general of immigration has issued word that railroads will not be permitted to import foreigners to take the place of striking shop men.

A record trip was made by the Mount Kisco special on the Harlem Railroad last night with the new engine, No. 1,413, the special invention of Cornelius Vanderbilt, Jr. The run was the fastest ever made on the road and the engine drew five cars. It made the run between Pleasantville and Chappaqua at the rate of a mile in forty-two seconds. Between Chappaqua and Mount Kisco, with many curves along the line and covering a distance of five miles, the train made the run in 4 minutes and 15 seconds. The Vanderbilt engine is built after the style of the "hog," and it was not believed it could develop such great speed.

A hard legal contest is now in progress in Chicago to determine the rights of the Sanitary Trustees as against those of private corporations in regard to the development of water power along the Drainage Canal. Injunctions, dissolutions, restraining orders and condemnation proceedings are all being employed. So far, the public has not been able to discover who is behind the corporation fighting the trustees, for everything has been kept close under cover. It is figured that should the corporation plans be carried out, the sanitary district would lose a probable yearly revenue from the sale of water power of $150,000.

A mammoth brick-making plant called the Crisna Company is about to be installed near Madrid, Spain, under the protective eye of King Alfonso XIII, and more than $600,000 worth of American machinery goes into the enterprise. An idea of its magnitude may be gathered from the fact that the plant will cover nearly forty acres of ground, while human

labor will be reduced to a minimum unprecedented in Europe by the use of steam shovels, automatic cars, and other up-to-date American labor-saving combinations. The most modern American methods will be followed throughout.

The great Soo power canal was temporarily filled with water a few days ago as an experiment, but without any ceremony. The water will probably be all pumped out and then turned on finally at a later date. This water power canal is regarded by engineers as the finest structure of its kind in the world. It was built by private enterprise, cost the Michigan Lake Superior Canal Company upward of $5,000,000, and consumed more than four years in the work of construction. It is two and one-third miles long, 220 feet broad and deep enough to float the largest vessel sailing the lakes. It is estimated that the canal will accommodate a flow of 30,000 cubic feet of water per second. Above 1,500,000 cubic yards of material was removed, the cutting at times being made through the solid rock. There are several novel features about the canal, among them a massive power house, a movable dam, an ice rack to catch ice and logs and divert them into the river, and large compensating works at the head of the rapids. The turbines used for harnessing the energy, it is estimated, will develop about 40,000 actual horse power.

The final details in the sale of the Bethlehem Steel Company to the United States Shipbuilding Company have been completed, and the new ship trust now operates that immense steel armor and gun plant. By the transaction Charles

M. Schwab, president of the United States Steel Corporation, became a much wealthier man and incidentally he emphatically refuted the statements of Wall street financiers made at the time he purchased the Bethlehem Steel Company that he had secured a white elephant. It is understood that for the payment of $7,500,000 in cash to J. P. Morgan & Co. he again secured control of the Bethlehem Steel Company, and then turned it over to the United states Shipbuilding Company for $10,000,000 of collateral trust certificates of the latter company, $8,000,000 of its preferred stock and $8,000,000 of its common stock. In other words, the United States Shipbuilding Company is reported to have paid Mr. Schwab securities having a par value of $26,000,000 for a property for which Mr. Schwab paid $7,500,000 in cash.

In a formal statement recently issued Lewis Nixon said: "The United States Shipbuilding Company can now make proposals for a complete vessel. No other plant, either here or abroad, can do this.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 13.—Wanted, a first-class all-around machinist, who is a strict mechanic. One familiar with iron pattern work preferred. Is wanted for tool and pattern room. Permanent job for a steady man. Address H. L. L., care of Hill, Clarke & Co., Chicago.

Application No. 37.—Good mechanic, 38 years old, fair draftsman, has had charge of experimental department of small shop for eight years. Has also done installation work in power plants, etc. Wishes to become connected with a larger shop where there is a chance for advancement. Address F. D. care of Hill, Clarke & Co., Chicago.

Application No. 38.—Position wanted as foreman of pattern shop, by married man, 44 years old, 23 years' experience in a variety of work. References. Address H. W. H., care of Hill, Clarke & Co., Chicago.

Application No. 39.—Young man 18 years old, graduates from Manual Training School, and wants position. Will go anywhere, and can furnish references. Address I. S. K., care of Hill, Clarke & Co., Chicago.

Application No. 40.—Young man 20 years old, at present employed as only draughtsman of small concern, wants position with a larger firm where he can work hard and learn to design machinery. Has a good education and some shop experience. Good references as to character, etc. Address R. W. L., care of Hill, Clarke & Co., Chicago.

Application No. 41.—Position wanted as steam engineer by man of 50 who has been in the business for past 20 years. Thirteen years shop experience previously. Has held present position for past 6 years, but wants better place with more pay than $75 a month. Address R. E. G., care of Hill, Clarke & Co., Chicago.

Application No. 42.—Married man of 32, at present holding position as Mechanical Engineer for R. R. Co., wants permanent position with better pay, as Erecting Engineer. Has had plenty of experience and can furnish first-class references. Address R. O. S., care of Hill, Clarke & Co., Chicago.

Application No. 43.—Wanted, position as manager or superintendent of engine or tool works. Age 35. Past ten years in first-class positions. Address H. H. F., care of Hill, Clarke & Co., Chicago.

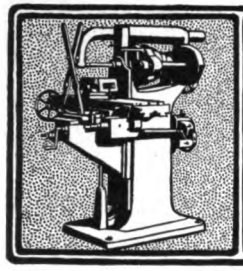
Application No. 45.—Young man, 24, wishes position as Junior Draftsman in Railroad or mechanical shops in Colorado, especially Denver. Experience as machinist in railroad shops and has done tracing, blueprinting, etc. Is now taking correspondence course in mechanical drawing. Temperate habits and is a good stenographer. References. Address W. R. M., Hill, Clarke & Co., Chicago.

Application No. 46.—Position wanted as foreman or assistant superintendent of machine shop; prefer, however, clerical position in machinery business where there would be a chance for advancement. Has had 14 years experience in a great variety of machine work (electrical included), and can furn s good references. Address R. A. L., care of Hill, Clarke & Co., Chicago.

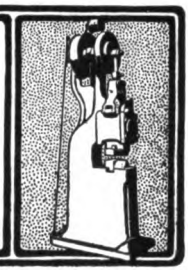
Application No. 47.—Married man 28 years old wishes position as draftsman Has had a great deal of shop practice and completed the draftsman's course with International Correspondence school. Strictly temperate habits. Five years with present employers. Address H. E. P., care of Hill, Clarke & Co., Chicago.

Application No. 48.—Superintendent of machine shop; applicant is personally known to this office and can be strongly recommended. Address Hill, Clarke & Co , (for G. B. C.) Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come to our care will be published free of all charges including correspondence with the interested parties.*



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop, and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

List of Second-Hand Tools in Chicago

SECOND-HAND LATHES

One Fitchburg Lathe. 15"x5'.
One 14" x 5' Engine Lathe.
One 15"x5' Stud Lathe.
One 14"x6' Flather Lathe, hollow spindle, plain rest, and power cross feed.
One 30"x15½" New Haven Lathe.
One 24"x19½" Engine Lathe.
One 15"x8' Flather Engine Lathe.
One 16"x8' Bullard Engine Lathe.
Two 14 'x5' Putnam Engine Lathes.
One 14"x6' Hendy-Norton Lathe.
One 16"x6' Blaisdell Lathe.

SECOND-HAND PLANERS.

One 24"x4' Davis Planer.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One Baush 8 spindle Multiple Drill, circular pattern. For 1" Drills.
One 24-inch Bickford Drill Press.
One No. 1 Friction Drill.
One 22-inch Prentice Bros. Adjustable Head Drill.
Two W. & R. Sensitive Drills.

SECOND-HAND SCREW MACHINES.

One ¾" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No. 2 Bardons & Oliver Turret Machine, plain head.
One No. 2 Bardons & Oliver Turret Machine, with wire feed.
One No. 4 Bardons & Oliver Turret Machine, with wire feed, friction back gear, and power feed to turret.

SECOND-HAND MILLING MACHINES.

One No. 24 Brainerd Miller, with centers.
One No. 2 Becker Vertical Miller.
One No. 3 Garvin Miller, with centers.

SECOND HAND SHAPERS.

One 15" Hendy Shaper.
One 24" Hendy Shaper.
One Traverse Head Shaper.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

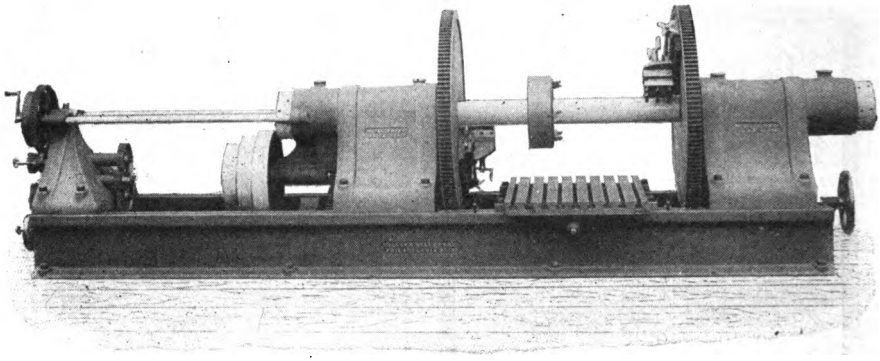
SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Fisher Boiler-Plate Chipper.
One No. 2¼ Pratt & Whitney Cut-off Machine.
One 5" Star Cutting-off Machine.
One 2" Hurlburt & Rogers Cutting-off Machine.
One Heavy Buffing Stand.
One No. 34 Toledo Power Press.

SECOND-HAND CHUCKS.

One 10" 4-jaw Union Independent Chuck.
One 9" 2-jaw Cushman Chuck.
One 6" 2-jaw round body Cushman Chuck.
One 10" 2 jaw box body Cushman Chuck.
One 6" Horton Cutting-off Chuck.
One 5" 2-jaw Chuck.

Hill, Clarke & Company.



A Sellers
Cylinder Boring Machine

which we secured through a firm going out of business, is now for sale at our Chicago Store, 14 South Canal street.

It is fitted with two facing heads, and has three cutter heads.

Diameter of boring bar . . .	**6 inches**
Distance between face plates . .	**48 "**
Height of bar above carriage .	**15 "**

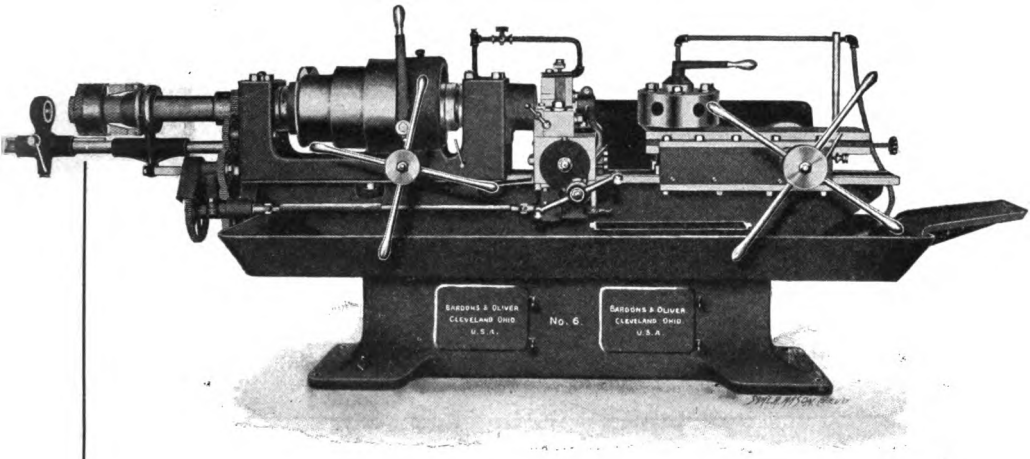
It is in perfect condition, complete with countershaft, and will be disposed of cheap.

Hill, Clarke & Company

Machinery Merchants

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street, with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance at 153 Greenwich street.
PITTSBURGH REPRESENTATIVE: Chas. G Smith Co., 347 Fifth avenue.

When writing, please say you saw it in SHOP TALK.



Turret Machinery

greatly reduces the time and expense of manufacturing duplicate parts, and especially so when it is Bardons & Oliver Turret Machinery.

The spindles of their machines are of large diameter and capacity, and with the automatic chuck, stock may be held firmly and close to the cutting tool with very little overhang from the main bearing.

The above cut represents a Forming or Blanking Machine with friction-geared head and turret slide. Note the solidity and convenience of all parts. See how deep the oil pan is.

Castings and forgings are handled just as advantageously as bar stock.

BARDONS & OLIVER

Cleveland, - - - - - Ohio

HILL, CLARKE & CO., Agents, Boston, Chicago and New York.

Thanks!

"I am much pleased with SHOP TALK and the improvements that I notice in it, almost every issue is an improvement on its predecessor. I will send you a contribution after a little I think that may help some one, if not every one of your readers. I have been a student quite a few years, but sometimes I think that I don't know very much of the trade as a whole yet for I get a new wrinkle every once in a while.

Respectfully,

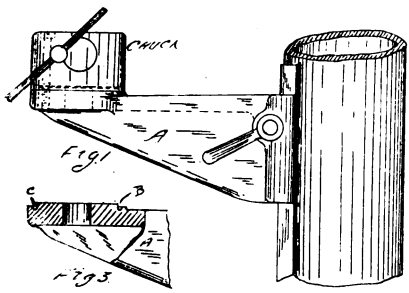
F. A. D."

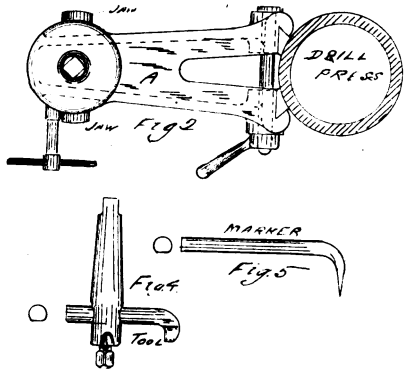
"Shop Talk"

NINTH NUMBER OF THE SECOND VOLUME.
SEPTEMBER, 1902.

Centering Attachment for Sensitive Drill Press and the Making of It.

THE attachment supplied with the Sensitive Drill Press had worn out, owing to its fragile construction. The gripper jaws being very narrow, hard work had quickly thrown them out of truth. As a great amount of our work consisted of centre drilling short bars of cold-rolled steel, which were required to be centered extremely accurately, the very slight wear proved fatal to its accomplishment. To replace it, the device presented in elevation Fig. 1, and plan Fig. 2 suggested itself. A bracket A was cast and fitted to the upright slide on the pillar in the manner shown, and a No 4 Horton Chuck was fitted to this by a method to be described. From a worn-out Twist Drill the tool detailed in Figs. 4 and 5 was made. With the marker Fig. 5 affixed instead of the tool, the shank being fixed in the drill press spindle, a circle was scribed on the upper surface (B Fig. 3) of the casting A (chalked) a little larger than the recess in the back of the chuck. The casting A was now unmounted and fixed on the lathe face plate, and the surface B (Fig. 3) turned to the section shown, but rather above size. In turning, a groove C was made to lessen the surface to be afterwards trued up in position. Replacing A on the Drill





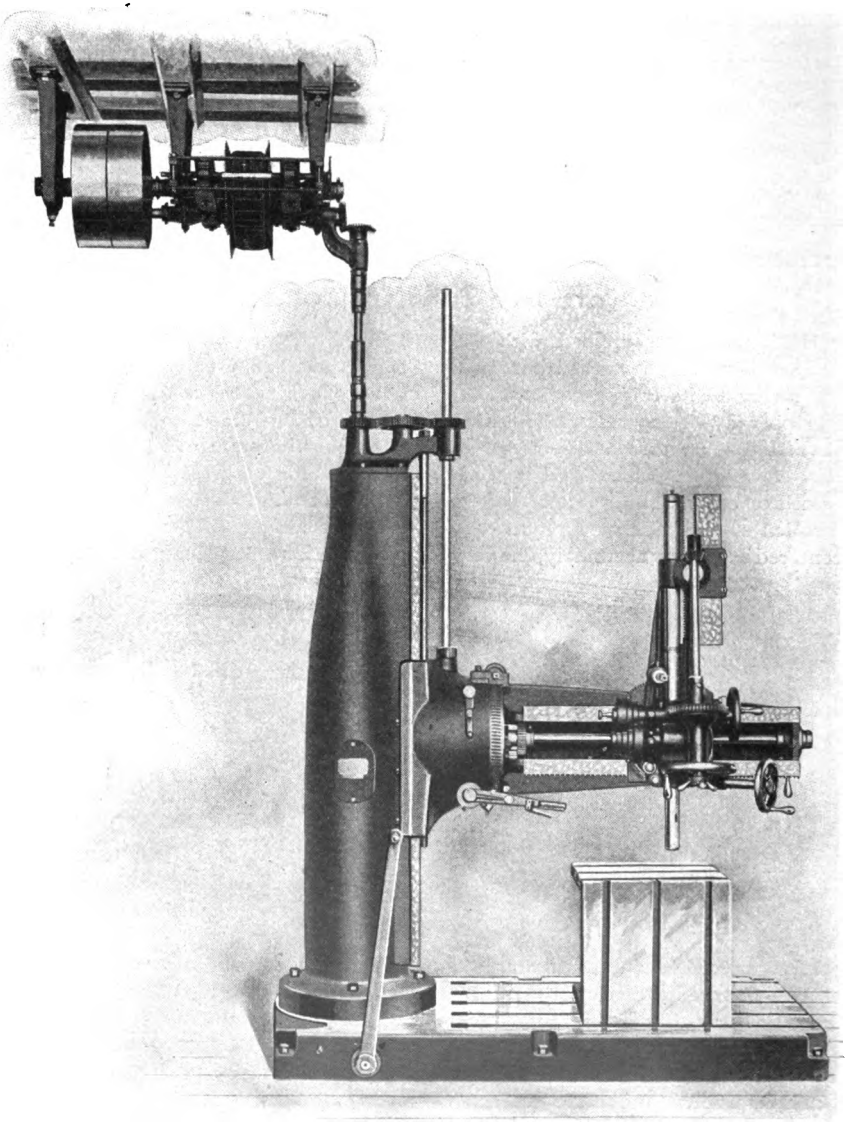
Press the turned surface was trued up by means of the tool Fig. 4, "going slow" and turning the spindle until every element of spring was lost. This method of finishing the tenon to fit in the chuck recess for back plate, resulted in dead accuracy being attained.

The attachment was a thorough success.

I might say that the box key was wedged tightly on to the screw so that it would remain in position under vibration.

FRANCIS W. SHAW.

Birmingham, Eng.



96-inch Western Radial Drill

Arranged for belt drive. See page 5

The Belt-Driven Radial.

THE more directly power is applied the bigger results it will give; the more indirect and complicated the transmission the greater the loss. Machinery men all know this, but some refuse to profit by it, because they either manufacture some sort of machine with complicated mechanisms or else buy one that another man has made. Everyone should try and avoid loss of power, for loss of power means waste. That's the reason we have put such a simple and direct drive on the Western Radial Drill. Power comes down the column, goes out the arm and is applied directly on the large diameter of the spindle at its lower end right down near the work. This avoids twisting strains and gives a greatly increased drilling capacity.

We told quite a little about the Western Radial last month, but not all, by a good deal – need a whole book for that. What we want to show this month is the 96-inch radial arranged for belt drive. The cut on page 4 gives the idea. This mode of driving does not interfere in the least with swinging the arm completely around the column, as there are two universal joints in the vertical connection. The variable speed transmission is just as handy, giving any speed whatever, from its highest to its lowest points, in a very few seconds. The speed can be suited exactly to the size of drill used and material being drilled, so that work will be done at the most advantageous rate. No part of the machine has to be stopped, either, to make a change in speed.

The 96-inch radial is built on the same lines as the 120-inch, with equal stiffness and reliability, big double column, circular arm and all.

Three Things Worth Knowing About the Horizontal Milling Machine.

IT is a very good plan to take the index plates (which usually come with dividing heads) and place them on an arbor turned down in the chuck so the plates will just fit snug, and with an ordinary "v" thread tool scribe circles passing through the centers of each circle of holes, as shown in Fig. 1. This is done in order to make it a simple matter to count the required number of holes for setting the sector, for without these scribed circles it is a rather difficult matter to trace the proper circle, especially on the circles with a great number of

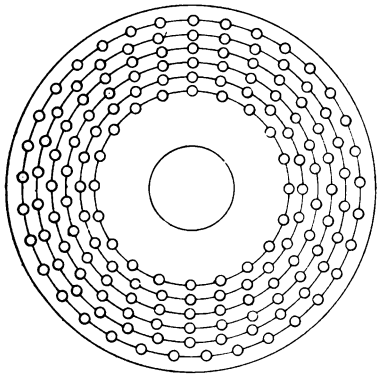


FIG. 1.

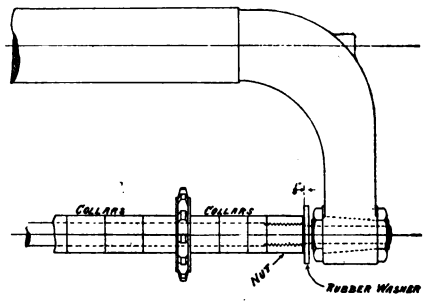


FIG. 2

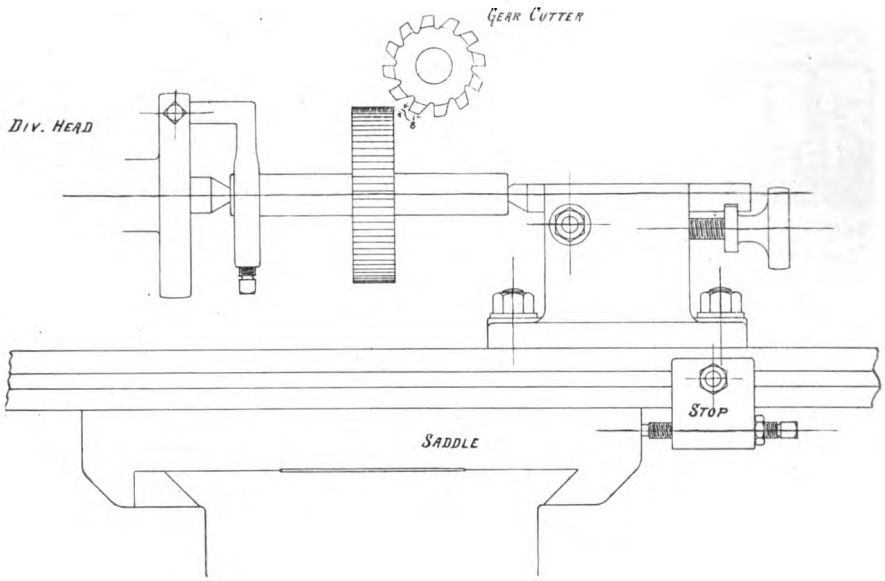


FIG. 3

holes like, for instance, where a circle containing 66 holes comes next to the one containing 63, then probably this one next to a 57 circle, etc. Any one who has "been there" would appreciate a plate scribed as shown, and it being such an inexpensive operation the wonder is the manufacturers of dividing heads do not see the point and send their index plates out scribed as shown.

2. In order to save the bearing on the end of the cutter arbors, as well as the receptacle for same in the overhanging arm from dust and dirt getting where it does not belong, cut a washer out of a piece of sheet rubber such as the engineer generally carries for packing, and cut the hole slightly smaller than the bearing end of arbor for a snug fit—outside diameter about two inches. This washer should be slipped up to the threaded part of the arbor, as shown in Fig. 2. Now, when the arbor is driven home very firm and the overhanging arm is brought up to the rubber washer with a slight bang, and clamped, your machine is O. K. for duty. The bearing should be oiled *after* the washer is slipped on, otherwise the washer will wipe the oil nearly all off.

If the above directions are followed the bearing will always stay nice and will not get cut, as it is absolutely dust proof. But here is the best part of this wrinkle: When you wish to remove the arbor, simply back your overhanging arm off so only about ¼ inch of the arbor projects into the bearing. Then by ramming the arbor with the rod it comes out like a shot, and there is no injury to either it or the arbor bearing, for the rubber washer acts as a cushion.

3. It is usually the case that with each Horizontal Milling Machine a stop is furnished which is a very handy article if made use of, which is, as a general rule, quite rare. But if those who have gears to cut place this stop on the end of the table where cutter starts, and set it so that when the table comes to a halt the cutter will just clear the blank being cut by about ⅛ inch they will not have to take a peek each time so as to be sure their cutter isn't going to do a little unnecessary trimming. Fig. 3 tells the story.

Chicago. HARRY ASH.

Milling Machines, and How to Use Them.

Chapter V.

THE fate of many a manufacturing concern rests with its tool room, for here are produced the jigs, dies, fixtures, boring tools, reamers, etc., suitable for the specialties manufactured.

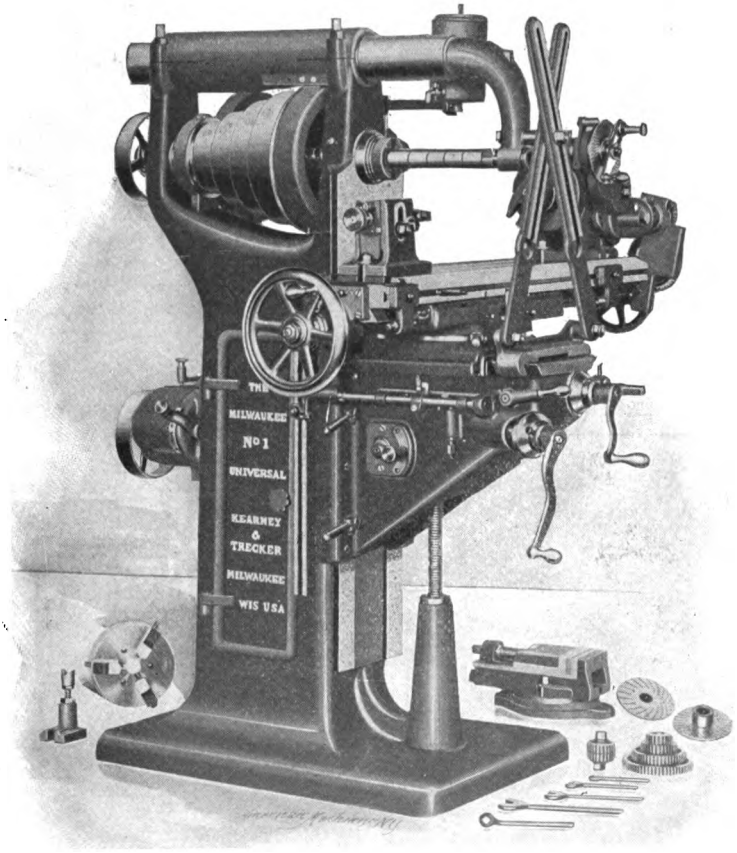


FIG. 1. THE MILWAUKEE NO. 1 UNIVERSAL IS AT HOME IN THE TOOL ROOM.

Do not consider it a necessary evil because it is classed as non-productive, for it is the equipment of well-designed, well-made tools that enables machine tools, standard and special, to come up to their highest efficiency, and place the factory in the fore front.

The machine tool equipment should be all that would be required to make a complete high class small machine shop, and the tool-making should be confined to it as far as possible rather than break up machines engaged in manufacturing.

Here the universal milling machine is at home, provided it is an up-to-date

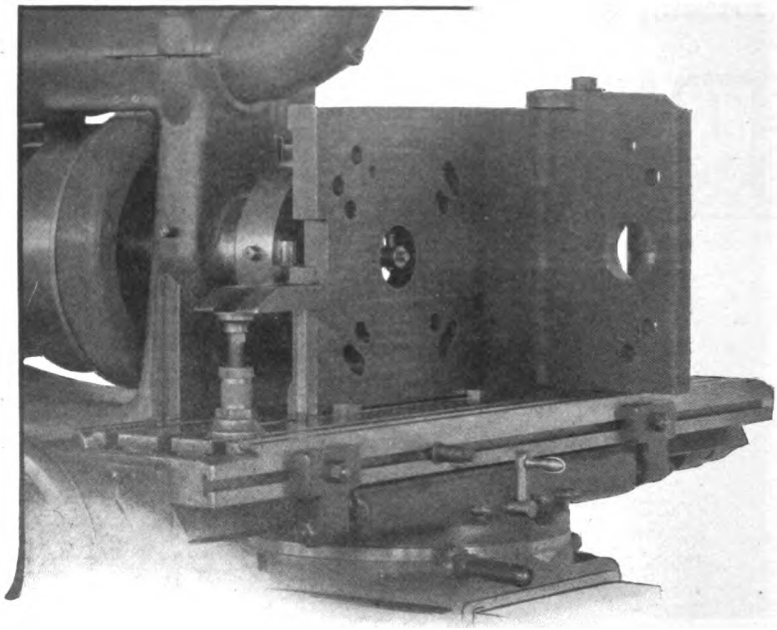


FIG. 2 BORING AN ANGLE PLATE.

machine such as was illustrated and described in the March number of SHOP TALK, or a No. 1 Milwaukee Universal (Fig. 1) and equipped with vertical work. The long automatic cross range makes it an excellent tool for accurate jig boring. Fig. 2 shows an angle plate used on the face plate of an engine lathe for

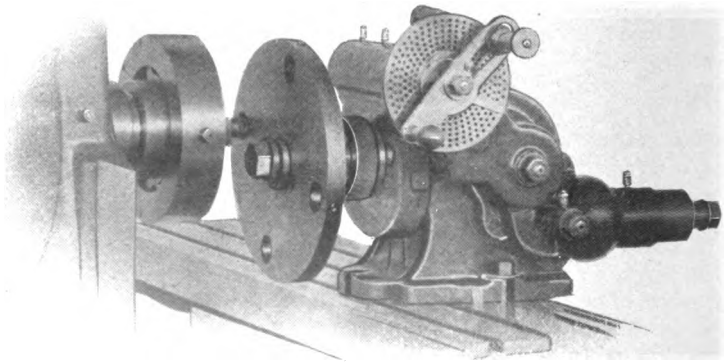


FIG. 3. BORING A CIRCULAR DRILL JIG.

spindle and rack cutting attachment. This machine has the greatest possible accuracy, convenience and range, and is adapted to every variety of tool room accurately boring a complicated piece that has two holes at right angles to each other. The angle plate was first milled on the edge in order to provide a surface

that would set square on the work table. The hole on the back for the lathe spindle plug was first bored and the plate shifted to the position shown. It is obvious that these two holes will be exactly the same height from the edge of the plate, and the work when placed upon it will be in line with the lathe spindle. If the piece had been a box jig, a long boring bar would have been used and the outer end supported in the overhanging arm. Usually it is better to make boring bars to fit in the taper hole in the spindle, as the chuck takes up some room. The chuck method, however, is very convenient, as the boring tool need be only a straight piece.

It often happens that an accurate circular jig is required so that the two pieces drilled will fit without matching holes. This can be quickly done, as shown in Fig. 3. Note that the dividing head has cross slot and side ears so that blocking and strapping are unnecessary, and the large dividing wheel insures accuracy.

In designing tools for a given piece, it should be carefully studied, taking into account parts that are related to it, and be sure that the different operations are performed in the best order to secure the greatest economy. Encourage, as far as possible, the use of the face mill for all milling operations; it will pay. Fig. 4 indicates the position of the dividing

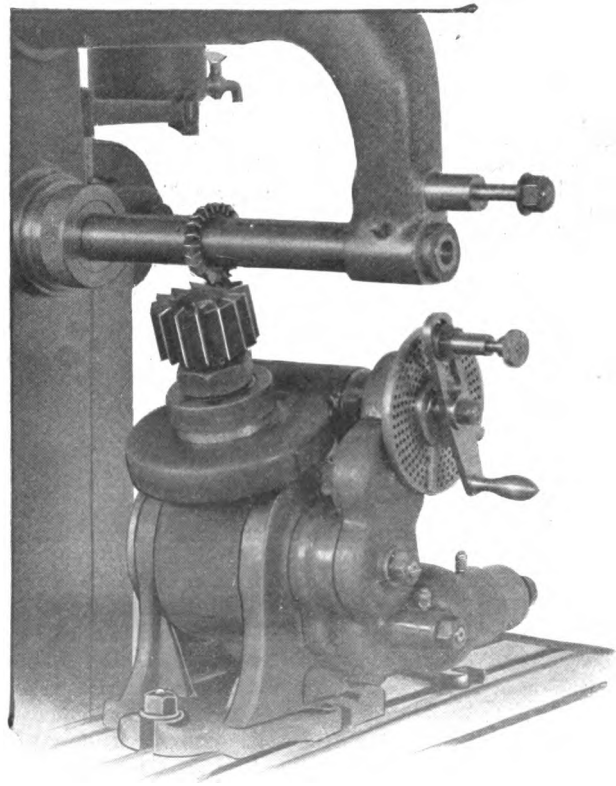


FIG. 4. OBTAINING THE CORRECT ANGLE.

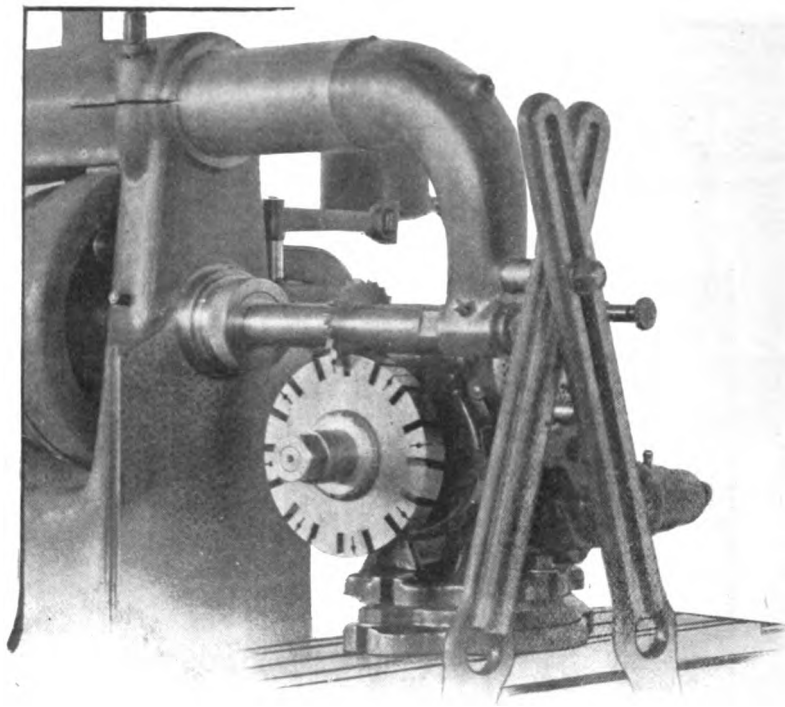


FIG. 5. THE DIVIDING HEAD SWIVELED ON THE GRADUATED VISE BASE.

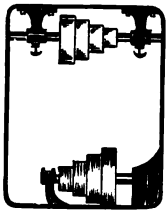
head for milling the teeth in the face of a cutter made from the solid. The depth of the cut must be less as the tool approaches the center, and it is, therefore, necessary to set the head at an angle from the perpendicular. It is desirable to leave the same width of stock on the edge to be ground. This makes it necessary to vary the angle according to the size of the cutter and number of teeth. The angle can be found by calculation or graphically, but the same result will be attained by taking a few trial cuts. It will be noted that the gearing for spiral cutting remains entirely covered when the spindle is elevated.

Inserted tooth cutters should have top rake—10 degrees is good.

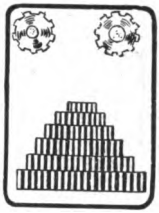
The dividing head interchanges with the vise base, which makes it possible to quickly set the head at any angle to the machine spindle, as shown in Fig. 5. A zero line on the head corresponds to the graduations on the vise base. It might be well to add at this point that the vise base should not be used under either vise or head, except when it is necessary to perform work at an angle, as it only blocks the work up that much higher.

Some builders have swivel vises so constructed that they must always be used at a great elevation—it is bad practice.

The balance of this chapter is devoted principally to spiral milling, but is omitted this month for lack of room. October "SHOP TALK" will tell the rest. Be sure you get it. EDITOR.



EDITORIAL SHOP TALK



IT is well in almost any sort of business to have a distinctive mark or sign, familiarly known as a trade-mark, which from constant use in connection with all literature and advertising of that business, becomes associated with it in the mind of the public so closely that this mark seems indeed a very part of it. Many try to accomplish this result by a name, "Uneeda" being a conspicuous example of success, but here still, the box form and design themselves, as well as the printing of the name, constitute a trade-mark.

The Chicago Machine Tool Company, following what has been found to be good practice, have adopted the trade-mark

here shown, consisting of the word "Chicago" with a large "C," printed all in red. This association of product and mark is accomplished by use of name and form of design together, and all printed matter pertaining to this company, as well as every machine which they manufacture and send out bears this imprint. It is a mark of excelience, and is backed up by machine tools unsurpassed by any. When this mark is seen on any machine it means quality. Brains, ability, skill and good judgment are behind the "Chicago" products. Look at the 12-inch Chicago speed lathe on another page of this issue, for example.

Just at present we know of three good openings for able draftsmen who are familiar with machine details. How long these positions will remain unfilled we cannot say, but up to this writing they are still vacant. Good men are wanted and will be given a chance. "Always room at the top" is just as true today as it ever was. One position is in Chicago, another in a smaller Illinois town and the third in New England. If you are contemplating a change or are dissatisfied let us hear from you. Of course, we cannot take any responsibility as regards the getting of the position. We simply desire to bring supply and demand together. Our mission is to tell the employer where he can find a man, and the man where he can find an employer, that's all. Then they have to settle it themselves. But we're always glad to do as much as we can for both sides. Here are three good drafting positions open now. Are you interested?

How They Felt.

"How do you feel?" asked the physician of the parson.

"I feel for-giving," replied the good man.

"And you?" he asked of the auctioneer.

"As usual, for-bidding," answered the red flag follower.

"And you?" queried the M. D. of the Kentucky colonel.

"Oh, you know me, doc," replied the Kentuckian. "I'm always for-get-full."

—*Ex.*

The 12-inch Chicago Speed Lathe.

THIS speed lathe is built upon the same general lines as the 10-inch described in July SHOP TALK, only a little larger all around. It is fitted with the regular "Chicago" dust-proof, self oiling bearings, which, we reiterate, is an unusual advantage for a speed lathe. Five steps on the cone give any speed desired.

The tail stock is of good design, the cut-away pattern, and is rigidly clamped to the bed by the lever shown on the side. One motion does it, and is more convenient than the kind where it is necessary to reach underneath. Screw and lever motion are both provided to the tail spindle, and the lever may be lifted off when desired. The tool rest is clamped in a manner similar to the tail stock.

The design of the bed is unusually strong as well as graceful, and it also economizes floor space. Finish is regular "Chicago" style.

Countershaft is the "Pullet" type arranged with five steps. Pull to start it and pull to stop it; easy to put up and no trouble to take care of; positive in action and very reliable.

We might say that both centers to this speed lathe are hardened and ground before being sent out. This saves a lot of work and bother on the lathe's arrival and insures the centers running true. Don't know anyone else who does this, do you? Other good points will show up when you use a Chicago Speed Lathe.

Another Gas Engine Kink.

BY ALBERT STRITMATTER.

WHAT'S the matter with that gas engine now? Why don't you start her up?"

"That's just what I've been trying to do for ten minutes. She was all right yesterday, but this morning when I went to start her she wouldn't go at all,"

"Maybe you're not using the right size priming charge. Let's try with different sizes."

"No use. I've just been trying that. I've used a very little and gradually increased it until I know I've got too much. Sometimes she gives a first shot but not a second. And every once in a while she fires in the exhaust pipe as if she was going to blow the place up."

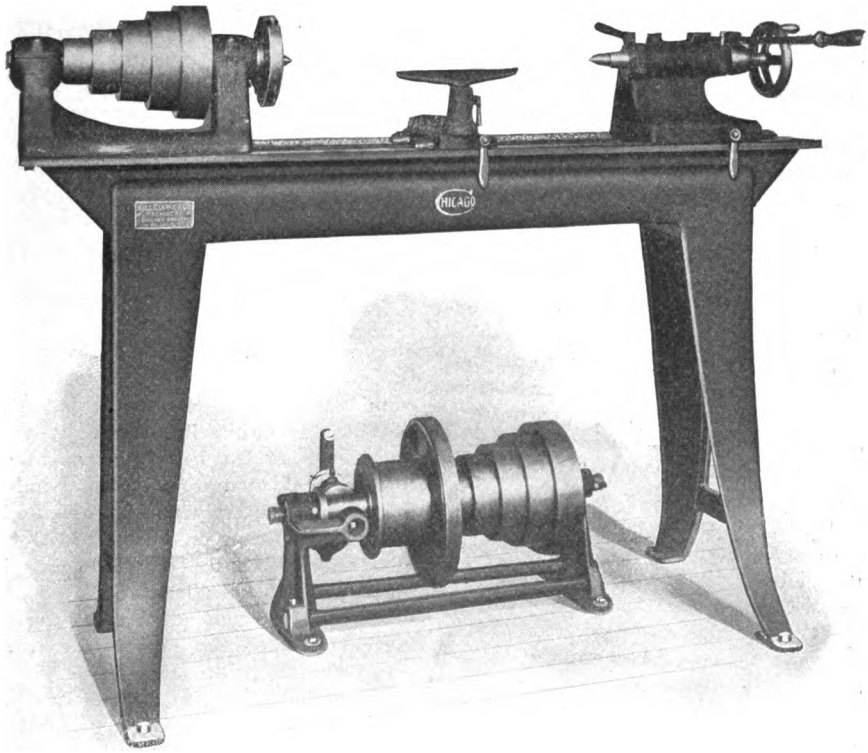
"Well, maybe it's in the battery. Have you tested the spark?"

"No, I didn't think of that. You know we just renewed the battery last week with new plates. I didn't put in new solutions as the old ones seemed to be all right."

"Well, let's see if she gets a spark. Maybe your old solutions are no good."

This conversation took place between the shop foreman and the man who undertook to care for the gas engine. On testing the sparking mechanism, it would give only a very feeble spark and not always that. This might have been caused by defective insulation of the insulated electrode or by the igniter points being scaled or corroded. In order to determine whether or not this was the case, the wires from the battery, outside of the engine, were disconnected and touched together and then separated to learn if the battery was all right. This test showed a very feeble spark and proved that the trouble was either in the connections from cell to cell of the battery, or else the battery was weak. As the old solutions were still in use it was decided to throw them out and put in new. When this was done a good "fat" spark was secured and the engine went off as merrily as could be.

(Continued on Page 14.)



The 12-inch Chicago Speed Lathe.

See page 12.

Meanwhile fifty men had been standing idle for three-quarters of an hour. Loss, at 50 cents per hour—$18.75.

Sometimes this same mistake, except in a slightly different way, is made Perhaps the battery plates seem to be good and new solutions are placed on the old plates when renewing the battery. This usually causes the same trouble as using new plates on old solutions.

As a matter of fact, the entire battery should be renewed at one time, as the manufacturers of batteries make them so that all parts deteriorate in about the same length of time, and to renew any one portion without the remainder does no good. Sometimes the battery will pick up strength over night from standing idle, but as soon as the engine is started and run awhile the battery quickly loses strength and begins to miss explosions.

These charges which are not exploded are, of course, exhausted into the exhaust pipe unburned. Perhaps by the time two or three have been exhausted in this way the battery will have gained strength and give a spark sufficiently strong to ignite a charge. As soon as this charge is exhausted the hot flame which escapes from the cylinder ignites the previously exhausted, and unburned charges in the exhaust pipe and a "pipe explosion" results. These explosions are rather terrifying to one who does not know their cause, but they usually do no serious damage as the exhaust pipe is strong enough not to explode. Not infrequently, however, the exhaust pot or exhaust muffler plates are cracked, or if the exhaust pipe discharges into a chimney flue some of the bricks may be broken.

These explosions of course always result from explosive charges being exhausted unignited. In other words, they are caused by mis-fires. As has already been explained, a weak battery will cause them. Or, starving the engine will also do it. Suppose that the throttling valve is so adjusted that too little fuel is given the engine on each charge. The mixture of gas or gasoline and air being too "lean," the spark fails to ignite it. Perhaps two or three charges are missed in this way. Of course a portion of the charges remain in the combustion or clearance space of the cylinder and finally they enrich an incoming charge sufficiently to make an explosive mixture, or one which the spark will ignite. When this charge is fired and exhausted the flame from it explodes the unburned gas in the pipe just as has been explained when the battery is weak. One may wonder why the flame of the exhaust will ignite the charges when the spark in the cylinder will not. But as the flame is much larger and hotter than the comparatively small spark given in the cylinder, it will ignite the charge more readily.

There is one thing in connection with the gas engine battery which many engineers overlook, and that is that to leave the switch in while the engine is not running will short circuit the battery. Leaving the switch in over night will sometimes run the battery down more than several months of usage would. Sometimes a battery which has given excellent satisfaction on one day will be utterly useless on the day following if the switch has been left in. There are some engines which automatically open the circuit when the engine stops and with these this point need not be given attention, but otherwise a little care in regard to this will save considerable money which would otherwise go for battery renewals.

New Catalogs.

The 1902 Catalog of the Skinner Chuck Company is at hand, presenting their complete line of independent, universal, combination, geared scroll chucks, planer chucks, drill chucks, face plate jaws, etc. Especial attention is drawn to their "1901 Pattern," which embodies the good qualities of the earlier patterns as well as recent improvements which are now used for the first time.

The Hardening and Tempering of Tools for Sheet Metal Working.

BY TUBAL-CAIN.

F the hardening and tempering of dies and all manner of press tools too much cannot be written, as upon the results of this part of their construction depends the efficiency of the tools.

In order to harden a die properly, great care should be taken; first in the heating of the steel, and second in the quenching. In all shops where dies, or other tools which require hardening, are constructed, a gas furnace or "muffler" should be used for heating, but when a muffler is not handy, charcoal should be used. When a muffler is used to heat steel parts for hardening, provide a number of 3/16" rods. Put them in with the steel and remove one from time to time during the heating process to test the temperature.

For hardening large dies it is indispensable to have a large tank which should be arranged in such a manner as to insure a rapid cooling of the steel. A tank of this kind can be arranged by fixing two or three rods across the inside about 12 inches below the surface of the water, and a pipe let into the tank in such a manner as to allow of the circulation of a stream of water from the bottom upward. When the die is to be quenched, the water should be turned on and kept running until the steel has cooled, for when a good circulation of water is kept up in the tank during the hardening process, there will not be any soft spots in the die after hardening.

It is often necessary to construct dies from forgings of wrought iron and tool steel, and as the dies when finished are required to be hardened, it is necessary that there should be a good weld between the two parts. To accomplish this result, when welding mix mild steel chips, from which all the oil has been removed, with borax, and there will be no difficulty in producing a clean weld and one which will not buckle or separate in hardening.

HARD OR SOFT PUNCHES AND DIES.

At times, when tools are required for sheet metal working, it is hard to determine whether a punch or die should be hardened, or whether one of them should be left soft—and if so, which one? The stock to be worked, and the nature of the work, have to be considered when deciding this matter. Some classes of work will be accomplished in the best manner by using a soft punch and a hard die; others when a hard punch and a soft die are used, while in a majority of cases the best results will be obtained by using a punch and die that are both hard. For punching or shearing heavy metals both die and punch should be hard, while for all metals which are soft, and not over 1/16" thick, a soft punch and a hard die will be found to work well. By leaving one of the dies soft it will be easy to produce clean blanks during the life of the tools, as when the punch and die become dull it will only be necessary to grind the hard one, upset the soft one, and shear it into the die.

HARDENING AND TEMPERING DROP DIES.

If there is one class of tools, the hardening of which is less generally understood than others, it is the class used for drop presswork. When dies of this class are to be hardened, special care is necessary. Instead of plunging the whole die into the quenching bath (when heated properly) set it on end in an inclined position, and direct a strong stream of cold water on to the face of the die. By having the stream strong, the whole die face will be covered, and the contraction of the metal at the surface will be equal. Allow the water to strike the die until the

water ceases to boil, and then gradually diminish the stream and allow the die to cool slowly. By placing the die in the inclined position when hardening, the water will run off the face and thereby the bottom will remain soft and hot while the die portion proper will be hard, which is always a desirable condition in dies of this kind. At the same time the temper can be drawn by the heat remaining in the base of the die. When the color appears turn the water on until cool.

HOW TO HARDEN LARGE RING DIES.

To harden large ring dies, which are to be ground after hardening, and which are required to be very hard about the edges and the walls, they should be heated in large iron boxes as follows: Put a layer of fine powdered charcoal about two inches deep in the bottom of the box and place the die on it. Fill the die and cover it to a depth of about three-fourths inch with a mixture of four parts powdered charcoal to one part of charred leather, then put a loose cover on the box and place in the furnace. After heating about three hours or more, according to the size of the die, the die will be at a red heat. It should then be allowed to remain at a low heat for about an hour, which will insure its heating uniformly throughout. The heat should then be increased until the die comes to a full red heat; it is then ready to be quenched.

Remove the box from the furnace, and with two pairs of tongs, and a man at opposite sides—if the die is too large for one man to handle—draw the die from the box, clean and quench squarely into the water, working up and down until the red has entirely disappeared, then let it lie still until cool. When cool, remove the die from the water and heat to remove the strain and chill of hardening—until drops of water sprinkled on it will steam. Then lay it aside in an even temperature where it will cool off slowly. When large ring dies are hardened in the manner described above there need be no fear that they will warp, crack or shrink excessively or unevenly.

STEEL FOR SMALL PUNCHES.

When small punches are required to punch heavy stock or to operate at high speeds, never use drill rod or Stub's steel, for the reason that such steel is of the finest high carbon variety and will crystallize rapidly under concussion. In place of such material use one of the low grades of steel; one which in order to harden, it will be necessary to heat to white heat, and the punches will last much longer than if made from the high grades of steel.

For small punches which are required to pierce thin soft stock, or to operate at a slow speed, get the best grades of steel procurable, as for such uses the finer the grade the better results which will be obtained.

HARDENING A BLANKING DIE.

After a good clean fire has been built, all screw and dowel holes in the die should be plugged with fire clay or asbestos. By taking these precautions, the tendency of the steel to crack around the holes is, as far as possible eliminated. Now heat the die to an even cherry red, so that the entire plate will be the same temperature; then remove it from the fire and dip it endwise into the water (which should be warmed slightly to take the chill off), being careful to dip down straight, and not to move it or shake it around, as that would increase the possibility of the die warping, or shrinking excessively. After removing the die from the water, it should be immediately warmed. Now grind the face of the die; heat a thick piece of cast iron red hot, and place the die upon it; it can then be drawn evenly to any temper desired. By taking a piece of oily waste and wiping the face of the die as it is heating, the different colors will show up clearly. When the color denoting the temper required appears, remove the die and allow it to cool off slowly.

(*Continued next month.*)

NEWS & NOTES

LABORING men of Chicago are proposing to have a summer home near Marinette, Wisconsin. Prominent leaders of the Machinists' Union of Chicago have secured an option on 3,000 acres of land, and propose to turn it into a summer resort—a place where life in the open air can be enjoyed at a minimum expense. The property the committee of machinists has in view is rich in woodland scenery and vistas of lake and stream. Brook trout abound in the creeks, and the forest and fields offer opportunities for excellent shooting in season. Negotiations are said to be practically completed and the land will soon be transferred to a co-operative corporation.

The negotiations just concluded by President J. W. Duntley, of the Chicago Pneumatic Tool Co., give to the Chicago corporation control of the International Pnumatic Tool Co. and the Tait-Howard Pneumatic Tool Co. of England, which are now merged in a new Anglo-American combine, called the Consolidated Pneumatic Tool Corporation, with a capital of $10,000,000. It is reported that in addition to the four works already operated in the United States the company will immediately erect a third British plant in the vicinity of the Glasgow shipbuilding district, while the establishment of continental works in Germany is an early probability.

A clever engineering feat is to be undertaken in Chicago. The dome of the Masonic Temple, which is one of the highest buildings in the city, is to be lifted and another story added to the skyscraper. The Masonic Temple rises 306 feet above the street and there are twenty-one stories, containing 450 offices and stores. The work involved in this contemplates the raising of the immense dome of the building six feet and the lowering of the roof garden theater floor six feet, giving twelve feet more of perpendicular height. The enabling the building to acquire a new and additional story must be only a matter of wonder to the outside world, which keeps little apace of what engineers are doing.

Another evidence of the trend towards industrial betterment is shown in Cincinnati, Ohio, where the J. A. Fay & Egan Co. and the Lane & Bodley Co. are planning the erection of a building upon the site of their Bond Hill factories, for the benefit of the workmen. It is intended that the project shall be in the nature of a combined boarding house and restaurant, and the purpose is to so conduct it that it will take the place of the usual saloons and lodging houses which spring up in the neighborhood of large manufacturing establishments.

The *Amalgamated Journal* has officially announced that the rebate proposition submitted to the tin lodges by the American Tin Plate Company through the conference committee has been voted down. The defeat of the proposition means that the Standard Oil Company, the Armour meat packers and several other concerns which ship their goods in tin packages to Europe and which have been buying their tin plate from Wales, will continue to do so. Had it carried, these firms would bave placed their orders for about 1,500,000 boxes of tin with the American Tin Plate Company.

The farthest wireless telephoning on record was accomplished recently between Sassnitz and Kolberg, Germany, a distance of 105 miles.

As no one could be found in this country who was willing to advance $25,000 to pay for a series of practical airship flights, Santos-Dumont has returned to Paris. He does not intend to revisit this country till 1904, when he will take part in the St. Louis exposition airship competition.

The American Fork & Hoe Co., with a capital stock of $4,000,000, half preferred and half common, has been organized under the laws of New Jersey. The company has purchased a majority of the plants engaged in manufacturing hand farm tools, the names of the selling companies being withheld from the public for the present.

The greatest Labor Day parade ever known in Chicago, and probably in any American city, marched through the streets on September 1st. Sixty thousand toilers, including 1,200 women, were in line for seven hours, and the time to pass a fixed point was over five hours. Several thousand dollars was gathered in along the route in an immense contribution box and two huge flags, for the benefit of the striking miners.

The census bureau has issued a bulletin on the subject of the localization of industries, prepared by Frederick S. Hall, to show localities that excel in the product of certain manufactures. It gives new names to several cities. Measured by the value of products, more than 85 per cent. of the collar and cuff manufacturing is carried on in Troy, N. Y.; 64 per cent. of the oyster canning industry in Baltimore, Md.; 54 per cent. of the manufacture of gloves in the adjoining cities of Gloversville and Johnstown, N. Y.; 48 per cent. of the coke manufacture in the Connellsville district of Pennsylvania; 47 per cent. of the manufacture of brassware in Waterbury, Conn.; 45 per cent. of the manufacture of carpets in Philadelphia, Pa.; 45 per cent. of the manufacture of jewelry in Providence, R. I., and the adjoining towns of Attlebury and North Attlebury, Mass.; 36 per cent. of the silverware in Providence, R. I.; 35 per cent. of the slaughtering and meat packing industry in Chicago; 32 per cent. of the manufacture of plated and britannia ware in Meriden, Conn.; 24 per cent. of the agricultural implements industry in Chicago, and more than 24 per cent. of the silk industry in Paterson, N. J. The number of wage earners engaged in slaughtering and meat packing in South Omaha, Neb., constituted 89.9 per cent. of the total number employed in all industries in the city during that year.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 14.—Wanted, experienced mechanical draftsman, Vermont, for general machine shop; specialty, paper making machinery and mill work. State age, education, experience, with whom, and salary required. Address B. F. M., care of Hill, Clarke & Co., Chicago.

Opening No. 14.—Wanted, two or three young draftsmen, 17 to 25 years, to design and detail under instructions on special machinery, general machine work, special fixtures, tools, etc. Prefer those with some shop experience. Pay according to ability and experience. Address M. M. C., care of Hill, Clarke & Co., Chicago.

Opening No. 15.—Competent designer and draftsman wanted who has had some experience in designing machine tools, and has also had practical experience in the shop. Would have full charge of all drawings and pattern records. Address "Illinois," care of Hill, Clarke & Co., Chicago.

Application No. 45.—Young man, 24, wishes position as Junior Draftsman in Railroad or mechanical shops in Colorado, especially Denver. Experience as machinist in railroad shops and has done tracing, blueprinting, etc. Is now taking correspondence course in mechanical drawing. Temperate habits and is a good stenographer. References. Address W. R. M., Hill, Clarke & Co., Chicago.

Application No. 46.—Position wanted as foreman or assistant superintendent of machine shop; prefer, however, clerical position in machinery business where there would be a chance for advancement. Has had 14 years experience in a great variety of machine work (electrical included), and can furnish good references. Address R. A. L., care of Hill, Clarke & Co., Chicago.

Application No. 47.—Married man 28 years old wishes position as draftsman Has had a great deal of shop practice and completed the draftsman's course with International Correspondence school. trictly temperate habits. Five years with present employers. Address H. E. P., care of Hill, Clarke & Co., Chicago.

Application No. 48.—Position wanted as superintendent of machine shop; applicant is personally known to this office and can be strongly recommended. Address G. B. C., care of Hill, Clarke & Co., Chicago.

Application No. 49.—Position wanted as mechanical draftsman, by young man of 20. Has had Manual Training School and Correspondence School courses, also nine months' work in machine shop. Good references as to character. Will go anywhere with proper position, but prefers Boston or vicinity. Address C. W. G., care of Hill, Clarke & Co., Chicago.

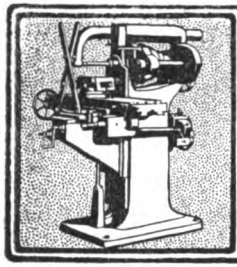
Application No. 50 —Man of 28 wants to learn a line of machinists' tools and supplies, or special machinery, and then act as road salesman for same. Has 11 years' experience as practical machinist, some road experience, and a course with Scranton schools. Good references. Address R. E. C., care of Hill, Clarke & Co., Chicago.

Application No. 51.—Position wanted as foreman to take charge of machine shop; 22 years' experience. Will go anywhere. Address W. T. B., care of Hill, Clarke & Co., Chicago.

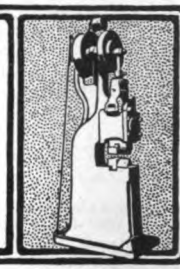
Application No. 52.—Position wanted as toolmaker or general mechanic. Plenty of experience as superintendent and foreman, and exceptional ability both as a toolmaker and in handling help. Temperate, steady and energetic, and can furnish A No. 1 references. Address J. C. B., care of Hill, Clarke & Co., Chicago.

Application No. 53.—Position wanted as bookkeeper or for general office work in machinery or tool supply business. Has eighteen years' experience. Moderate salary desired. Address R W., care of Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published unde this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come to our care will be published free of all charges including correspondence with the interested parties.*



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop, and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

Boston has

One 38" x19½' New Haven Engine Lathe, with taper attachment, good as new.

List of Second-Hand Tools in Chicago

SECOND-HAND LATHES

One Fitchburg Lathe. 15"x 5'.
One 14" x 5' Engine Lathe.
One 15"x5' Stud Lathe.
One 14"x6' Flather Lathe, hollow spindle, plain rest, and power cross feed.
One 30"x15½" New Haven Lathe.
One 24"x19½" Engine Lathe.
One 15"x8' Flather Engine Lathe.
Two 14"x5' Putnam Engine Lathes.
One 16"x6' Blaisdell Lathe.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One Baush 8 spindle Multiple Drill, circular pattern. For 1" Drills.
One 22-inch Prentice Bros. Adjustable Head Drill.
One W. & R. Sensitive Drills.

SECOND-HAND SCREW MACHINES.

One ¼" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No.2 Bardons & Oliver Turret Machine, plain head.
One No. 3 Bardons & Oliver Turret Machine, with wire feed.

SECOND-HAND MILLING MACHINES.

One No. 24 Brainerd Miller, with centers.
One No. 2 Becker Vertical Miller.
One No. 3 Garvin Miller, with centers.

SECOND HAND SHAPERS.

One 15" Hendy Shaper.
One 24" Hendy Shaper.
One Traverse Head Shaper.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Fisher Boiler-Plate Chipper.
One No. 2½ Pratt & Whitney Cut-off Machine.
One 5" Star Cutting-off Machine.
One 2" Hurlburt & Rogers Cutting-off Machine.
One Heavy Buffing Stand.
One No. 34 Toledo Power Press.

SECOND-HAND CHUCKS.

One 10" 4-jaw Union Independent Chuck.
One 9" 2-jaw Cushman Chuck.
One 6" 2-jaw round body Cushman Chuck.
One 10" 2 jaw box body Cushman Chuck.
One 6" Horton Cutting-off Chuck.
One 5" 2-jaw Chuck.

Hill, Clarke & Company,

Machinery Merchants.

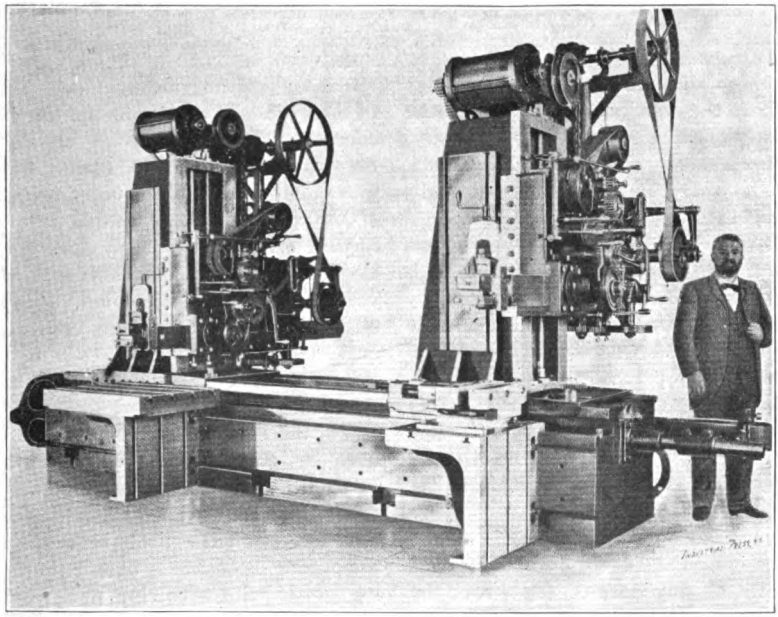
BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street; with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance 153 Greenwich street.

"Shop Talk"

TENTH NUMBER OF THE SECOND VOLUME.
OCTOBER, 1902.

A Duplex Traveling Head Shaper.

THIS traveling head shaper, built by the Morton Manufacturing Company, of Muskegon Heights, Mich., operates on their well-known "draw cut" principle, and is capable of finishing large pieces of work which would be found very difficult or unwieldy to finish in any other way. It is electrically driven.



The shaper has a 36-inch stroke, 30-inch vertical feed on the column, and the length of the bed is 14 feet. It is built either single or double-headed and furnished with one or two tables as the case may require. When so desired, the tables may be constructed to raise and lower for purposes of adjustment.

The machine has automatic feeds in both directions, and is also provided with means whereby the aprons and columns may be moved by power, either vertically or horizontally, when adjusting them to the work. The movement of the column on the bed is obtained by a screw which remains stationary, the nut revolving.

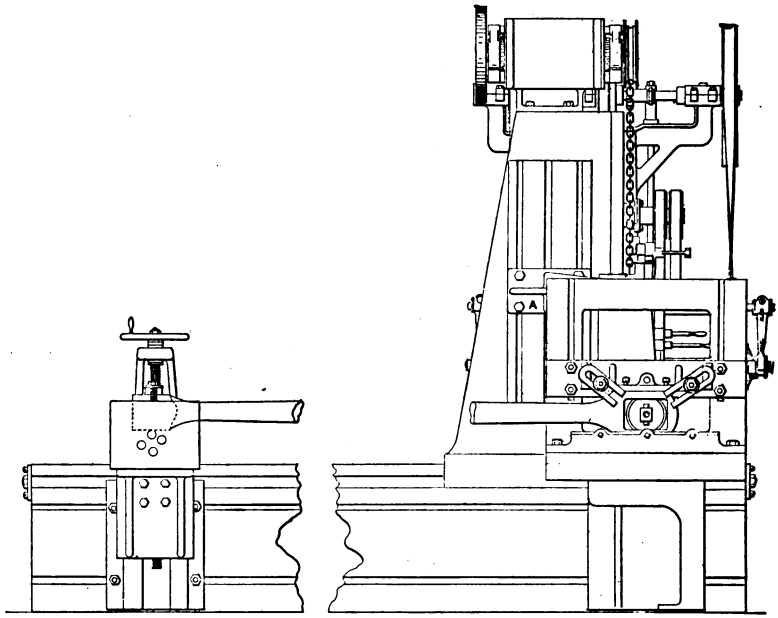


FIG. 2. MACHINING A SOLID END CONNECTING ROD.

The apron of the shaper is gibbed and fitted to the vertical column, and the vertical adjusting screw is also stationary, being operated with a revolving nut. These revolving nuts are fitted with ball-bearing thrust collars.

The ram is square and has a bearing on all four sides, wear being taken up with taper gibs. The stroke is adjusted by tappets on a circular disk and a suitable lever is provided whereby it may be reversed at any part of the stroke. The reciprocatory motion of the ram is obtained by two friction clutches, one being operated by an open belt and the other by a cross belt. It has a quick return stroke of three to one.

The countershaft is provided with a friction clutch and is stopped and started instantly at any part of the stroke by means of a lever provided for this purpose, which brings the machine under complete control of the operator.

The friction feed is of the automatic relieving type and is positive in its movements.

The aprons are counterbalanced by a special coil spring arrangement inclosed in the cylindrical casing at the top of the column. The rail bearings on all portions of the machine are square and the gibs employed are of the taper type.

One commendable feature of this shaper in which it differs from any other that has ever been produced before, is that of the vertical feed on the column, which enables the machine to take vertical side cuts and makes it well adapted for internal work. The head may be removed and a special head secured to the end of the ram so that internal slotting may be accomplished with this tool. Each head is driven independently, so that either one may be brought into action and operated entirely independent of the other. Both heads obtain their feeding power with revolving nuts from the same screw.

A particular advantage with this style of shaper is that one head can be operated on a piece of work 30 inches above the table, while the other head may be operated at any intermediate point.

The illustration, Fig. 2, shows this

shaper machining an opening in a solid end connecting rod. It will be noticed that a suitable adjustable chuck is provided for holding the end of the rod to be machined, and a support *A* is placed between the top of this chuck and the column of the shaper. This allows the machine to be fed vertically or horizontally. When machining the opening, a cut may be taken across the bottom, then the head turned ninety degrees and a cut taken up the side; it can then be changed and a cut taken across the top and another change made and a cut taken down the end. This enables the opening of a connecting rod to be planed out on all four sides, the rod remaining in a stationary position.

As will be seen in Fig. 2, the outer end of the rod is supported in a suitable chuck placed on the second table of the machine. When but one table is furnished, an adjustable jack is used for this purpose.

It will be seen that with the automatic feeds on the column and the range which the shaper has, a great deal of irregular work may be accomplished which has heretofore been difficult to reach with any tool.

It may also be used in the capacity of a portable shaper, as with the vertical adjustments on the column, it is adapted to be used in connection with a floor plate, in planing off spots on large castings, pillow blocks for medium-sized Corliss engine frames, etc. The plate on the front side of the column is planed so that a suitable bearing may be placed in between the work and the frame of the machine, thereby putting the thrust of the cut directly against the column.

This shaper is very heavily geared and capable of taking a cut of 1¼ inch deep in steel, with 1-16 inch feed.

We are agents for the Morton Co.

The Hardening and Tempering of Tools for Sheet Metal Working.

BY TUBAL-CAIN.

CRACKS IN DIES—THEIR CAUSE.

HEN a piece of tool steel, in itself of no great commercial value, is worked out and finished into an intricate die, through labor cost amounting to a large sum, the steel is, of course, very valuable; and if cracks show after the hardening process, or the die is spoiled, it means a great loss to the establishment.

Now, in the first place, although we are usually apt to confound cracks with hardening, very often the trouble can be traced to the preceding operations of annealing, forging and finishing. Of course there are a large number of dies spoiled through carelessness or inexperience in hardening, but still I believe there is a great amount spoiled through imperfect preceding operations or through the operator not being familiar with the nature of the steel.

A die may be carefully heated to give the proper temperature throughout, and may be quenched in the bath in the most approved manner, but if it is not "slightly warmed" after removing it from the hardening bath, it is liable to crack. This reheating may be done in a number of ways. The best way is to hold the die over the fire until it is heated to a temperature sufficient to cause a few drops of water to steam when sprinkled in it. The heat will not be sufficient to make any of the temper colors appear.

The author has been connected with one establishment where thousands of dies are made every year, and every die was reheated after hardening, in the following manner. A large tank provided with a perforated tray, with means for raising and lowering it, was used. The tank was filled with water to within two inches of the top and a steam pipe was

connected with it. Thus the water was kept at the boiling point, and the die, directly after hardening, was placed upon the tray, which was then lowered into the bath.

We have known dies to crack while in the forge when the blaze struck the die portion proper. This is brought about by sudden heat and then a cold blast of air, causing the steel to expand and then suddenly contract again, at a certain point, and as the consequent expansion and contraction does not extend over the entire surface, the change is local and cracks result.

Sometimes a piece of steel which is to be used for a punch or die proves hard upon starting to machine it, although it has been annealed. When this is the case, never try to finish it before re-annealing it; instead, rough it down, clean out the centers, if there are to be any, and anneal it over again. The time required to re-anneal the piece of steel will be more than made up in the machining of it.

A die made from a blank cut from a bar and machined and worked out without annealing is liable to crack when subjected to the hardening process, particularly if the die is for a blanking die of odd shape as shown in Figure 1. If annealed bar steel is used, the necessity of re-annealing is also imperative, as the first annealing does not eliminate the liability of cracking.

When it is not possible to anneal the die blank before finishing to size, the next best thing to do is to heat the die uniformly throughout to a red heat, then remove from the fire and allow it to cool until black. It may then be reheated to the proper temperature and hardened. In a forging die the bulky portion has a tendency to contract away from the small portions, which, being frail, harden first and do not alter their shape, while the bulky portion continues to contract unevenly, after the thin portion becomes rigid, and thin cracks are apt to appear when the tool is removed from the quenching bath. By heating dies to a red and then allowing them to cool to a black before the hardening heat, this uneven contraction is to a certain extent guarded against.

In hardening a die, the quenching of it so that the frailest portion enters the bath first and hardens before the thickest portion, will almost invariably cause cracks to appear, as unequal contraction takes place and the heavy portion contracting the most, changes shape in attempting to draw with it the frailer portions.

Another cause of cracks in dies is the use of improper means for grinding. When a die is ground on a machine on which no provision is made for water cooling, or where a fine wheel is used, cracks often result, coming about through the steel being unevenly heated during the grinding. By using a coarse wheel with a free water supply this disagreeable possibility will be eliminated.

HARDENING THE WALLS OF A ROUND DIE.

Often, in die work, it is desired that the walls of a drawing die, for instance, or some other part, such as inside of a hollow punch, should be hard, and the remaining portion soft. This may be accomplished by proceeding as follows: Clamp the die or punch, as the case may be, between flanges on the ends of tubes, being sure to have the steel at the proper heat. Then allow a stream of cold water or brine to circulate through the tube, and the metal will harden in depth as far as the inside edges of the flanges, while the remaining portions will remain soft.

WARPING OF LONG PUNCHES IN HARDENING.

After carefully hardened, a long punch will often be found to have warped during the process to such a degree as to make it useless. There is a way to avoid this altogether, or at least the warp will be so slight as not to affect the efficiency of the tool. To ensure against warping, lower the steel, when at the proper heat,

squarely into the bath, lowering as far as possible into the center of the liquid. When this is done the heat will be absorbed equally from all sides, and the tendency to warp excessively will have been eliminated.

HARDENING VERY SMALL PUNCHES.

When a large number of very small piercing punches are to be hardened, they should be packed in closed iron boxes and the boxes heated. When all the parts have reached the proper heat, they should be entered into a bath of either oil or water, as the nature of the work may require, through a funnel. This will insure the entering of the parts vertically and prevent warping. Another way by which small punches may be heated is to cover them in a box with powdered charcoal and coke.

HOW TO HARDEN AND TEMPER A SPLIT GANG PUNCH.

The best way to harden and temper a split gang punch is by the method used for the punch shown in Figure 3. It was first heated and hardened in clear oil, dipping it from the back, and thus preventing, as far as possible, the two legs from crawling in toward each other because of the channel between them. By dipping from the back this was overcome, as by the time the cutting face was immersed, the back was hard and set. It was then polished and tempered by drawing from the back to a dark blue to within ¼ inch of the cutting faces, and quenched when these portions were a dark straw color.

TEMPERING A COMBINATION CUTTING AND DRAWING PUNCH.

After the face of the punch, such as shown in Figure 2, has been slightly sheared, and the edges of the drawing die slightly rounded and highly polished, the punch is hardened and then drawn by laying it alternately on each of its four sides on a hot plate, tempering the cutting edges to a dark blue and leaving the inside or drawing die portion as hard as possible. When finishing the blanking portion of the punch, care has to be taken to do it so that the drawing portion will be perfectly central.

TEMPERING SMALL PUNCHES.

Most all large die shops in which any amount of hardening and tempering is done, have discarded the method of tempering by colors, and have adopted the more reliable method of doing it in oil, gauging the heat by thermometer. A kettle containing the oil is placed on the fire and heated to a right temperature for the degree of temper desired in the work. The hardened parts are then thrown in and left in the liquid until drawn. By this method there is no possibility for the parts to become hotter than the oil. When tempering punches in this manner it is not necessary to brighten them before the operation, and where a lot of such work is done it will be accomplished much cheaper than if the old method was used, and besides, the most satisfactory results will be attained.

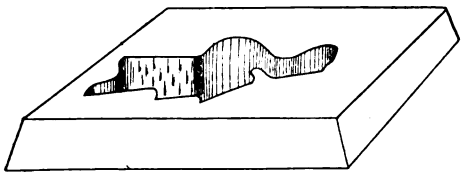


FIG. 1

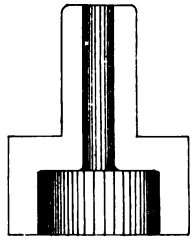


FIG. 2.

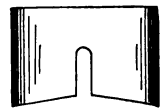


FIG. 3.

Our Little Fellow.

TO make our line of Chicago Grinders more and more complete we have just brought out a little one for the bench. It's not so very little, either, but takes a 12-inch wheel, and is, in fact, practically the same as the regular 12-inch column grinder except that it is cut off sooner, and of course needs no pan, the bench serving that purpose.

12-INCH CHICAGO BENCH GRINDER.

You would be a good deal prouder to have this fine looking machine in your shop, should some friends drop in to look it over, than if you had some ungainly arrangement all angles and rough spots, wouldn't you? And this one will do the work with less attention and more satisfaction than any other. The dust-proof, self-oiling bearings that only need an oil filler every six months or so are a lasting comfort.

Milling Machines, and How to Use Them.

Chapter V - (Continued.)

THE vertical spindle is made so that all tools will interchange with the horizontal spindle, and as it can be set at any angle it is a great time saver on a variety of tool work. The rack cutting attachment serves many purposes; besides rack cutting, Fig. 6 shows how a groove may be cut part way around a piece, and a steep spiral can be cut in the same way. The tail stock is graduated in degrees and can be set at any angle. When milling taper work, as shown in Fig. 7, set the head and tail stock spindles to the specified angle in place of allowing the tail spindle to enter the work at an angle to crowd it out of line.

Spiral milling is frequently required on tool work, and can be done only on the universal milling machine. The work table must be swiveled to the angle of the spiral and the dividing head spindle geared to the table feed screw by means of compound change gearing capable of a great many combinations.

The table for spiral cutting gives three figures, two of which must be known to find the other, and then all the data for setting up is given. These figures are diameter of work, angle of spiral, and pitch in inches to one turn. Generally the diameter and angle are known, as they would be if a cutter blank or drill were in hand. For example: take the three-groove chucking reamer, shown in Fig. 8, diameter 1¼", angle of spiral 24¼ degrees; looking in the table under diameter of work and following down to 24¼, then to the left we find the pitch in inches to one turn to be 12; this shows that gear 72 is required on the worm (or

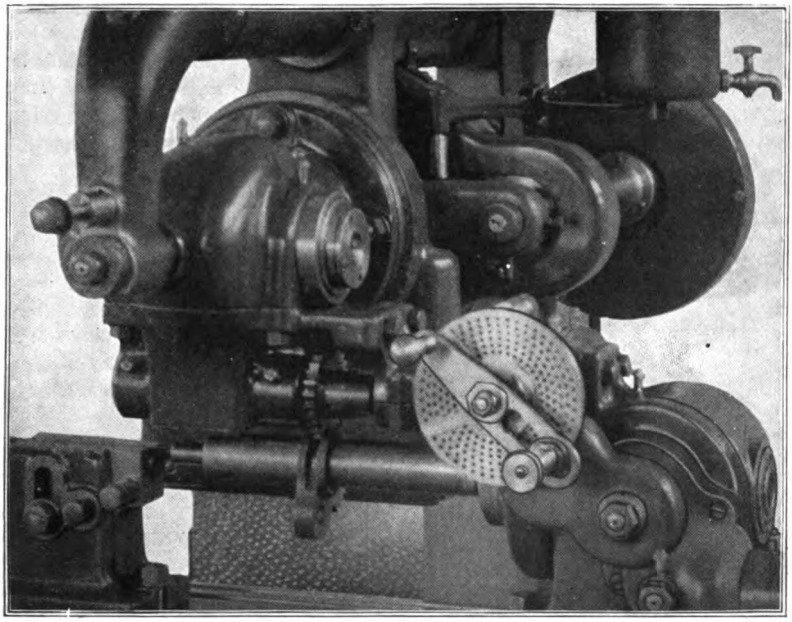


FIG. 6. MILLING CIRCULAR GROOVE.

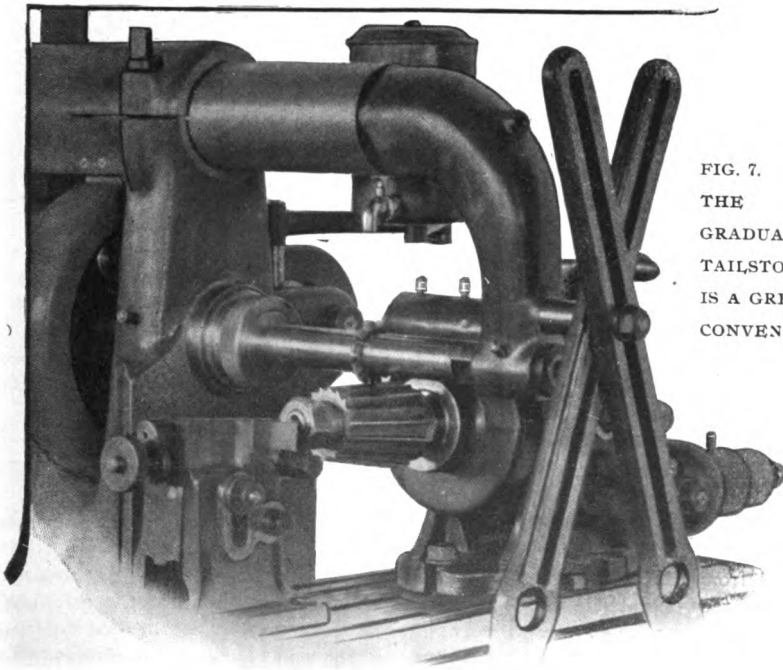


FIG. 7. THE GRADUATED TAILSTOCK IS A GREAT CONVENIENCE.

what is the same thing, the shaft on the dividing head leading to the worm) and gear 48 on the table feed screw. Then take the intermediate gear sleeve and put the first intermediate gear 40 on first and the second intermediate gear 32 on top of it; this will bring the 40 gear in mesh with the 72 on the worm and the 32 gear in mesh with the 48 on the table feed screw. The locking pin must be withdrawn from the back of the index plate and the feed operated as usual.

Milwaukee Universals are especially efficient on spiral milling, as the dividing head has a large worm wheel capable of standing the strain. Some makers of milling machines have very small worm wheels in their universal dividing heads, which makes it necessary to buy an extra head for spiral cutting, except for the very lightest work, and thereby increasing the cost without any additional advantage.

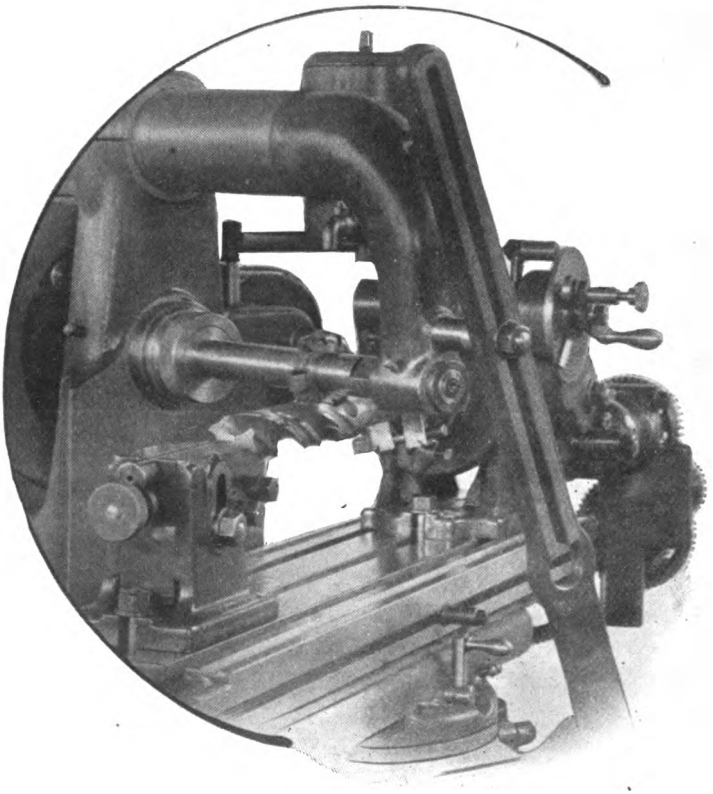


FIG. 8. NO SPECIAL HEAD REQUIRED FOR HEAVY SPECIAL MILLING.

The machine should be kept clean and well oiled, the change gears and other loose parts in the pigeon holes provided for them in the closet of the machine, and it will come to be the pride of the tool room, increasing in usefulness the more it is used and understood.

Bath Grinder No. 2.

BETTER and better, that's the way with all our tools. This time it's the Bath Universal Grinder that we talk about. Many heads at work to always keep the Hill, Clarke tools at the head constantly bring forth changes, additions, multiplications and improvements.

The improved Bath Water Grinder is shown in Figure 1 on page 12. The wheel head is gibbed to a vertical slide, which provides rigidity in any position. The vertical arm which carries the head can also be clamped in its bearings if desired. The head may be adjusted above center or below. Micrometer adjustment has been provided. The top portion of vertical arm is threaded, and moved by a combined hand wheel, nut and dust cap.

Figure 2 shows a thrust arm has been provided to prevent axle movement of the dust cap nut. To said arm is also attached an idler pulley arm, which can be clamped rigidly, or allowed to vibrate. It is keyed to prevent turning. The machine has also been provided to use water. The wheel head carries an adjustable hood. As the wheel becomes reduced in size it can be moved back or detached.

The knee and frame of the machine are so constructed that all water returns by the trough shown around the base of machine to the tank. This attachment is so constructed that it takes away all the water, producing no slop around the machine.

The swivel plate has two slots which enable the head and footstock and attachments to be used from the table without interfering with the head of clamp screw, which preserves the set alignment of the swivel plate. The two slots are also useful in surface work for clamping.

The knee swings around the column when in position for surface work and the machine has a new gear longitudinal automatic feed. The feed is driven from a drum above in the countershaft to a cone pulley at side of knee. When in use for cylindrical work the belt runs on large step of cone, and for surface work on small step, which gives the higher required speed for surface work.

The distance from the drum above to the cone is just the same, thus changing the belt according to knee position. The belt may also be removed from the cone if desired.

At the front of the bottom slide is an enclosed box apron having a removable top cover, so that all the inside workings of the feed can be easily reached.

Figures 1 and 2 each show the power cross feed attachment for surface work. It is so constructed that either one or two pawls may be engaged at same time, and adjusted to give a fine or coarse feed. The feed may be quickly disengaged by the knurled knob back of the large hand wheel.

This machine is intended especially for manufacturing concerns of sufficient size to need a large tool room. That is, companies who have enough ready money so that they can use it to make more.

His Last Word.

A country minister in a certain town took permanent leave of his congregation in the following pathetic manner: "Brothers and sisters, I come to say goodbye. I don't think God loves this church, because none of you ever die. I don't think you love each other, because I never marry any of you. I don't think you love me, because you have not paid my salary. Your donations are mouldy fruit and wormy apples, and 'by their fruits ye shall know them.' Brothers, I am going away to a better place. I have been called to be chaplain of a penitentiary. Where I go you cannot come, but I go to prepare a place for you, and may the Lord have mercy on your souls. Good-bye."

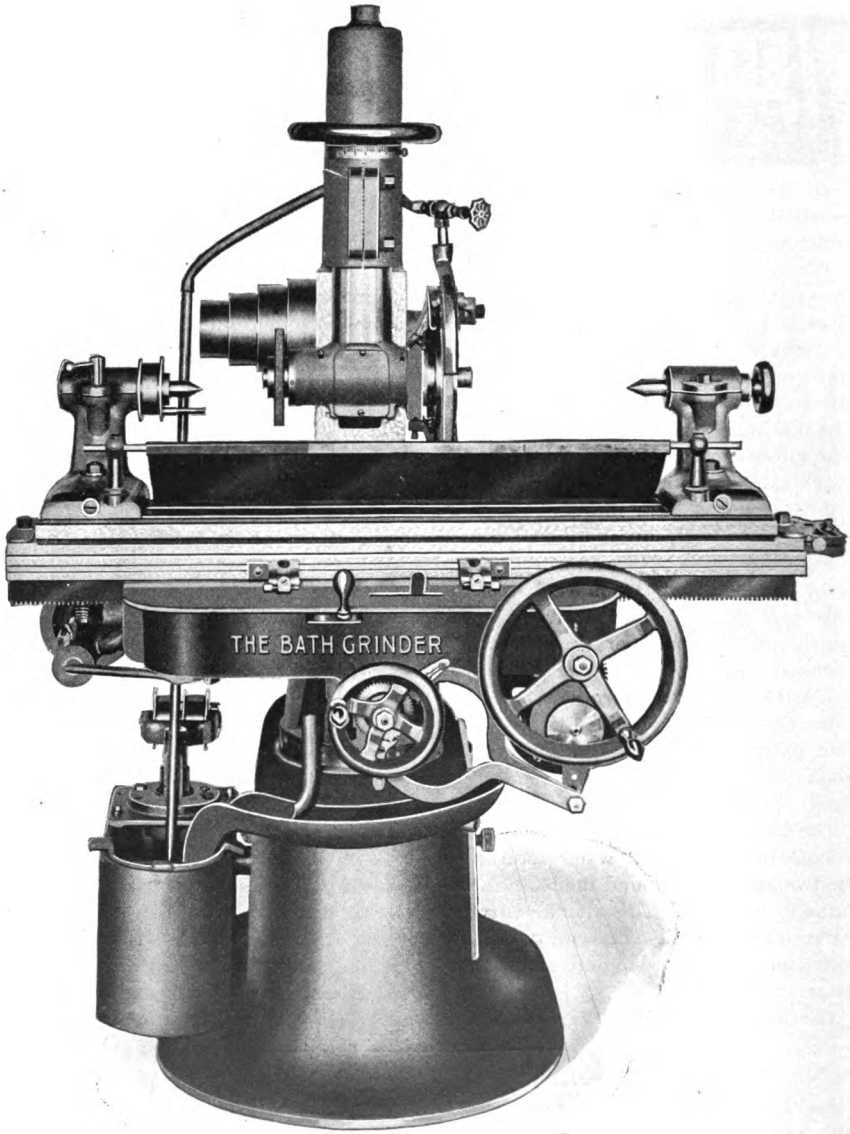


Figure 1.

Front View of the Bath Water Grinder

With tank, piping and water guard

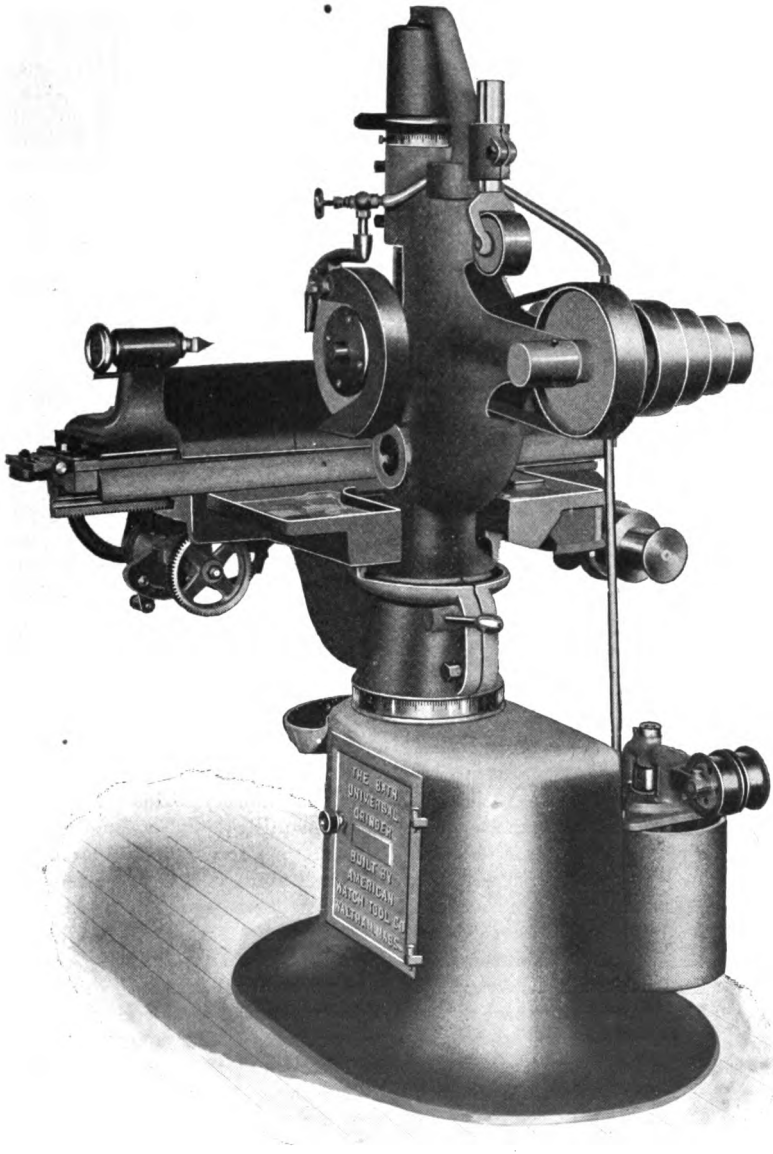
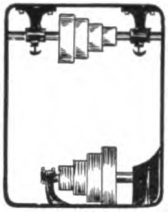


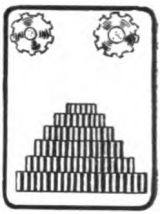
Figure 2.

Back View of the Bath Water Grinder

Showing driving mechanism, idler pulley, and wheel guard



EDITORIAL SHOP TALK



E have now in process of manufacture, but not yet quite ready for delivery, two new tools that will be found very useful in almost every machine shop. They are the best we at present know how to have made, and you are aware from past experience what our standard of excellence is—it's high. We are learning all the time, just like anyone else, how to do better work and design better tools, but somehow we seem to learn faster than the other fellow, and that's why we always keep ahead

One of these tools is a wet tool grinder, one that will be exactly what its name implies. It will keep the wheel wet to just the amount required while the tool is being ground, and then the supply of water on the wheel will diminish. There will be no traps or complicated means to do this either, and there will be no wet puddle around on the floor.—The other machine is a hand miller, one that you'll fall in love with at first sight. Our photographer did when he took a picture of the first one built, and said he would rather photograph it than the prettiest "miller's daughter." Perhaps one reason is that the machine would stand still and the young lady wouldn't. Anyway it's a handsome machine and has a larger range than any other machine of its sort now on the market We're sure you'll want one when you see it in next month's SHOP TALK, on account of its many superior features and the work it will enable you to turn out at small first cost and still lesser operating expense.

Englishmen employed in iron and steel mills work harder than Americans for less pay and turn out less material. This is the verdict of an expert commission of Englishmen, who came to the United States to study labor conditions in the iron and steel industry for the British Iron Trade Association. Enoch James made a special study of steel plants in this country. "The workmen at American mills," says Mr. James in his share of the report, "are generally supposed to be working much harder than they do in this country (England), but this is not my own view. After much conversation with many men in various branches who had been employed in similar works in England, and some subject to my own control, the conclusion I have arrived at is that the American workmen do not work so hard as the men in England. They have to be attentive in guiding operations and quick in manipulating levers and similarly easy work. They are also much more desirious of getting out large quantities than in England. They are better paid and more regular in their attendance at the works, loss of time through drinking habits not being tolerated."

Axel Sahlin, a well-known authority on blast furnaces, says the American workmen generally aspires to the higher grades of labor, leaving the merely manual labor to workmen of other countries. "Thus it is," he says, "that around American blast furnaces the American is found in a very decided minority. He may be foreman, master mechanic, blast engineer, locomotive driver or stove tender, but he will not work eighty-four hours a week shoveling ore or wheeling scrap. For those duties are employed in the South the negro and at the northern furnaces immigrants, mostly Irish, Slavs or Italians."

A Rapid Change Chuck.

A NEW tool recently patented by A. S. Davis, assigned to the Seneca Falls Manufacturing Co., Seneca Falls, N. Y., is here shown in Figures 1, 2 and 3. This tool is designed for use in the spindle of upright drills; also can be used in lathes and other horizontal spindle machines, for the easy and rapid change of drills, reamers, counterbores, taps, etc., without stopping the machine.

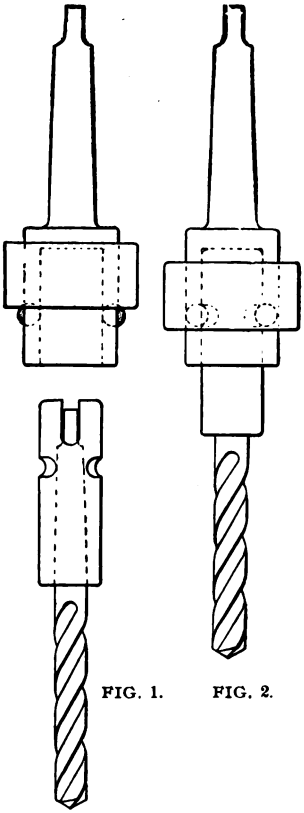


FIG. 1. FIG. 2.

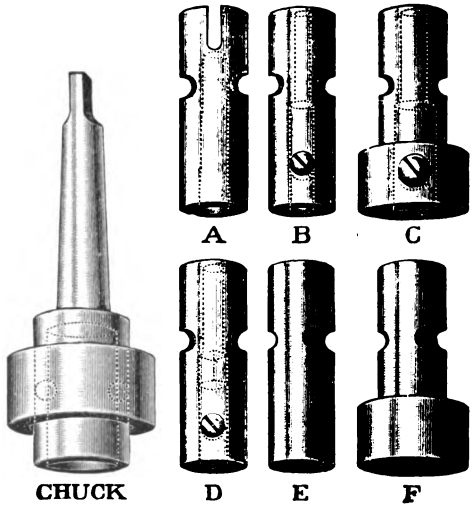


FIG. 3.

The chuck consists of a socket piece with two steel balls, also a locking ring mounted loosely on the body of the chuck, which may be held in the hand while the chuck revolves in it.

The colletts are provided with two segmental grooves for receiving the balls, which perform the double duty of holding the colletts in place and driving same.

Figure 1 shows collett released from chuck; Figure 2 shows collett locked in chuck; Figure 3 shows chuck with various styles of colletts and collett blanks that can be used.

To change the colletts, it is only necessary to raise the locking ring, which instantly releases the balls, allowing the collett to drop out, when another can be inserted, and by dropping (or releasing) the locking ring the balls roll into place, instantly locking the collett.

It is claimed that owing to the peculiar construction of this chuck, colletts can be conveniently and safely changed when the machine is running at the highest speed, as there is nothing to catch or shock the operator.

NEWS & NOTES

THE phenomenal demand for all kinds of iron and steel products shows no signs of let-up. The steel trust is making the biggest profits on record and still has orders ahead for months of work. Scarcity of coke is handicapping iron and steel output, and heavy importations of these products are being made.

News comes from San Jose, California, that a machine for paring peaches has been invented which promises to revolutionize the peach canning industry. A description of the new machine is given in the dispatches. The device operates automatically and accomplishes within a brief period the work of a small army of women.

Some time ago the Deering Harvester Company purchased 30 acres of land of the South Chicago Furnace Company at South Chicago, and as James Deering, of the Deering Company, has been a stockholder of the South Chicago Furnace Company since the organization of that corporation, it is probable that a merging of the two interests will take place in the course of time.

The length of submarine cable which is to form the first link in the American cable line across the Pacific has been completed, in England, and it will go at once to San Francisco by the cable steamer Silverton, via Cape Horn. This link in the cable will go from San Francisco to Honolulu, and it is expected that by the end of this year Hawaii will be in telegraphic connection with the mainland of the United States. The total weight of the cable is 10,000 tons.

The Government has awarded the contract for building the battleship Louisiana to the Newport News Shipbuilding Company at its bid of $3,990,000.

A contract of the value of $500,000 has been placed with the Westinghouse Company by the Clyde Valley Electrical Company, of Glasgow, Scotland, for the equipment of two generating stations to supply power for industrial purposes over an area of 755 square miles. The initial installations are to be of 6,000 horse power, and are to be completed within eighteen months. These will be the first of a series of great power stations to be built in the United Kingdom.

Records for equipment orders were broken last month by the Pennsylvania Company, when its management placed orders for the manufacture and delivery of 300 engines during the next twelve months.

So many large single orders for equipment and power have been given by both western and eastern railroads during the last three years that they no longer attract general attention. The Pennsylvania's order, however, is phenomenally large, and all the more remarkable from the fact that other large orders for power have been given by the company during the last eighteen months. It is also a remarkable fact that 200 of the engines will be built in the Altoona shops of the Pennsylvania Company and only one third of the order has been placed with outside companies. In due time the Pennsylvania will construct all its power and the larger part of its equipment in company shops. The cost of the new power ordered will be about $4,800,000.

Mr. Dooley on Machinery.

What's masheenery done f'r th' wurruld? says ye. It's done ivrything. It's give us fast ships and an autymatic hist f'r th' hod, and small flats, an' a taste of solder in the peaches. If annybody says the wurruld ain't better off thin it was, tell him that a masheen has been invinted that makes honey out if pethrolyum. If he asts ye why they ain't any Shakesperes today, say: No, but we no longer make sausages by hand.

An ad. in a trade journal will do what traveling men as a rule do not do. It will go to towns off from the railroad, where there are no hotels. It will work nights, Sundays and holidays, in wet weather or dry, hot weather or cold. It will talk to a merchant before some of the boys are out of bed in the morning and before they have gone to bed at night. It's one of the few things that has not yet struck for eight hours.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Application No. 48.—Position wanted as superintendent of machine shop; applicant is personally known to this office and can be strongly recommended. Address G. B. C., care of Hill, Clarke & Co., Chicago.

Application No. 51.—Position wanted as foreman to take charge of machine shop; 22 years' experience. Will go anywhere. Address W. T. B., care of Hill, Clarke & Co., Chicago.

Application No. 52.—Position wanted as toolmaker or general mechanic. Plenty of experience as superintendent and foreman, and exceptional ability both as a toolmaker and in handling help. Temperate, steady and energetic, and can furnish A No. 1 references. Address J. C. B., care of Hill, Clarke & Co., Chicago.

Application No. 53.—Position wanted as bookkeeper or for general office work in machinery or tool supply business. Has eighteen years' experience. Moderate salary desired. Address R. W., care of Hill, Clarke & Co., Chicago.

Application No. 54,—Position wanted as purchasing agent or storekeeper. Has had 19 years experience on railroad work and desires similar position. Last worked for American Electric Vehicle Co., New York, now in the hands of receiver. Address P. A., care of Hill, Clarke & Co., Chicago.

Application No. 55—Position wanted by married man of 27. Has had 12 years practical experience, 3 years in shop and balance designing automatic and special machinery, machine tools, jigs, etc., and general mill work. Would go to any part of country for suitable position, but prefers the east. Completion of present work reason for change. First-class references. Addres H. C. D., care of Hill, Clarke & Co. Chicago.

Application No. 56—Situation wanted as foreman of machine shop by a practical man with 10 years experience. Gasoline and steam engine work preferred. Have no objection to ordinary work. Can give the best of references. Address W. C. G., care of Hill, Clarke & Co., Chicago

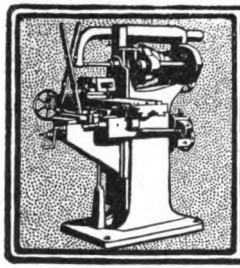
Application No. 57.—Position wanted as foreman of small shop, or large shop on small work, by man 27 years old. 14 years practical experience as machinist and tool maker, and expert on screw machines. Can harden dies, etc., and knows something of designing. Wages expected $3.50 up according to position. References. Address C. E. N., care of Hill, Clarke & Co., Chicago.

Application No. 58—Position wanted as general foreman or supt. in moderate sized engine or machine mfg. establishment or in mechanical department of a R. R. by a man of 28 who has had an unusual amount of all around experience in mechanical lines on railroads. What would just suit him would be a position where he could be of service both in mechanics and agriculture. Best of references. Address E. O. P., care of Hill, Clarke & Co., Chicago.

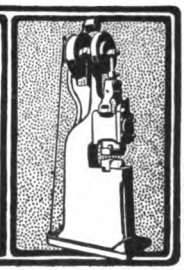
Application No. 59.—Position wanted as foreman of repairs in large manufactory. 20 years' experience as machinist, foreman of repairs, and millwright work. Address I. M. C., care of Hill, Clarke & Co., Chicago.

Application No. 60.—Position wanted as tool and machine forger by first class mechanic, 43 years old, married. Can handle lathes, planers, drills, etc., and has run power hammer for a number of years. Can make all kinds of dies for same, and temper them. Reason for change —too small pay. Address E. B. F., care of Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come to our care will be published free of all charges including correspondence with the interested parties.*



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop, and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

List of Second-Hand Tools in Chicago.

SECOND-HAND LATHES

One 15"x5' Stud Lathe.
One 90"x15½" New Haven Lathe.
One 14"x5' Putnam Engine Lathes.
One Fitchburg Lathe. 15"x5'.
One 14"x5' Engine Lathe.
One 16"x6' Blaisdell Lathe.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One 22-inch Prentice Bros. Adjustable Head Drill.

SECOND-HAND SCREW MACHINES.

One ⅝" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No. 2 Bardons & Oliver Turret Machine, plain head.
One No. 3 Bardons & Oliver Turret Machine, with wire feed.

SECOND-HAND MILLING MACHINES.

One No. 24 Brainerd Miller, with centers.
One No. 3 Garvin Miller, with centers.

SECOND HAND SHAPERS.

One 24" Hendy Shaper.
One Traverse Head Shaper.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

SECOND-HAND SUNDRY MACHINES.

One 2" Hurlbut & Rogers Cut-off Machine.
One Fisher Boiler-Plate Chipper.
One No. 2½ Pratt & Whitney Cut-off Machine.
One 5" Star Cutting-off Machine.
One 2" Hurlburt & Rogers Cutting-off Machine.
One Heavy Buffing Stand.
One No. 34 Toledo Power Press.

SECOND-HAND CHUCKS.

One 10" 4-jaw Union Independent Chuck.
One 9" 2-jaw Cushman Chuck.
One 6" 2-jaw round body Cushman Chuck.
One 10" 2-jaw box body Cushman Chuck.
One 6" Horton Cutting-off Chuck.
One 5" 2-jaw Chuck.

Hill, Clarke & Company,

Machinery Merchants.

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street; with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance, 153 Greenwich street.

Some Shop Talk.

It was midnight in the machine shop, and all was silent until the rasping voice of the file was heard to say:

"I have rubbed up against lots of hard things in my life, but this Harveyized steel job has completely worn me out."

"Well," said the lathe, sympathetically, "I have done many a hard turn myself."

"Life is a great bore," supplemented the gimlet.

"A continual grind," put in the emery wheel roughly.

"With many a broken thread," added the steam pipe in hollow accents.

"Calm yourselves," advised the damaged flywheel, "there may be a revolution soon."

"Don't mind him," said the soldering fluid acidly. "Every one knows he is cracked."

And in the confusion that followed the gas escaped.—*Judge.*

"Shop Talk"

ELEVENTH NUMBER OF THE SECOND VOLUME.
NOVEMBER, 1902.

A Trip Through the Intercepting Sewer.

BY WILLIAM LITTLE.

MANY people in the vicinity of 39th Street, in Chicago, have been puzzled by the uneven depressions of the pavement and the occasional displacement of the curb, and not everyone that steps across this street realizes that an immense underground river is soon to be flowing under them, through the huge intercepting sewer now in process of construction.

This sewer is nearly 2½ miles long, and all but 2,100 feet of it has been tunneled far underground without opening the surface of the street at all. From Butler to Halsted Street, where the sewer joins the south branch of the Chicago River, it was ditched in the open and then built over. The tunneled part, from the shore of Lake Michigan to Butler Street, a distance of nearly two miles, however, has been bored through from various shafts sunk along the route. The tunnel is 20 feet inside diameter, and the last stretch is expected to be done in about three weeks.

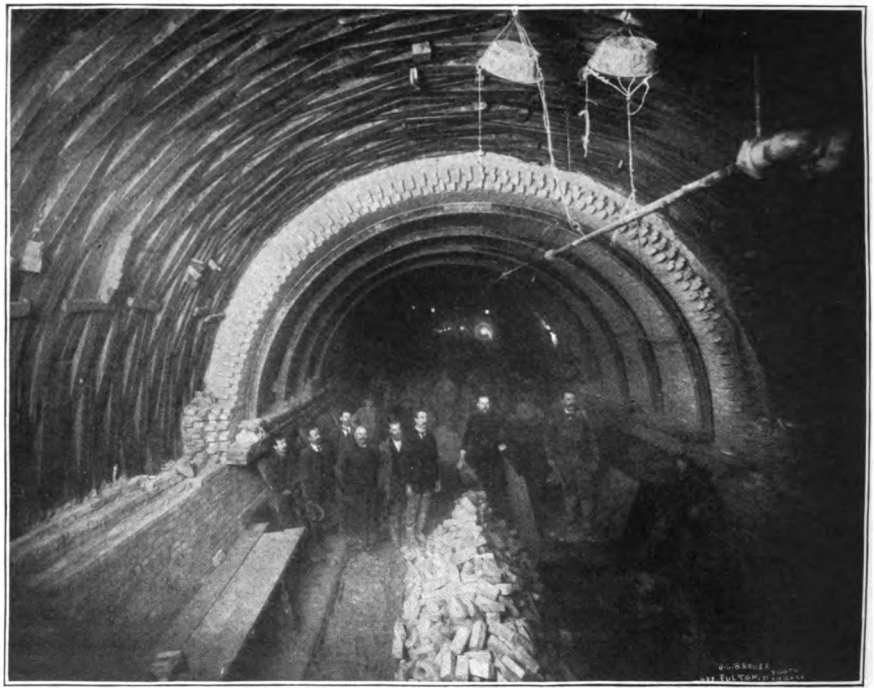
This big conduit is a part of the gigantic scheme for ridding Chicago of its large quantity of sewage by turning it into the already completed Drainage Canal, and sending it down to the Gulf of Mexico. This vein is to drain 12,000 acres of the city lying south of 21st Street, and is to have a flow of 900,000 gallons of water a minute, when the pumping station at the Lake Shore and 39th Street is completed. The total cost of the big sewer will be about $2,000,000 when it is finished.

Instead of the firm ground through which the tunneling was to have been done, it was found upon starting the work that large quantities of soft mud and quicksand were to be contended with, so that the entire work had to be done with a steel shield 24 feet 10 inches in diameter and 14 feet long. This shield is a very expensive affair, and consists of a big built up cylinder carrying on its front end a sharp edge three feet long which is advanced into the earth by means of 31 hydraulic jacks 5 inches in diameter. A working pressure of 4000 pounds to the square inch is used and is furnished from the power house above on the Lake shore. The jacks are set around the circumference of the shield and bear upon the 6x8 inch solid oak timbers with which the tunnel is first lagged as the work proceeds. Inside this oak lining, are run five courses of brick masonry all laid in hydraulic cement, so that the construction will last indefinitely. The oak being soaked with water and all air excluded from it, will keep for almost any length of time.

There is a sort of keyboard with the controlling valves to all the jacks arranged upon the shield, and a man standing on a platform operates these, releasing each in their turn when fully

extended, to allow a new section of oak timber, from three to four feet long, to be set in place. The jack is then set against this and the operation continued with the next jack, so that the shield is thus kept advancing, and the oak lagging set in place as fast as the bore is made. The average progress of the work is about 20 feet a day of 24 hours.

The lagging and lining, naturally, do not completely fill the space excavated and this is the cause of the gradual settlement of the pavement above. This soon adjusts itself, however, and when the street grade is restored it will remain level.



The accompanying illustration shows quite clearly the short sections of oak timbers which build up the first lining, as well as the several courses of brick which follow this up.

As the sharp edge of the shield advances into the dirt, men in the front scrape out the clay and dirt, which is tossed into tram cars and hauled back to the air-lock by mules, from whence it goes to the lift to be dumped outside. An air pressure of four pounds is used in the tunnel and the work proceeds continuously night and day, every day. The mules are stabled in the tunnel and never see anything but the electric light with which the tunnel is lighted.

A trip down through this underground wonder, when the visitor is properly clad in rubber boots and old clothes, and if he doesn't object to the temporary disarrangement of his ears caused by going through the air-lock, is certainly most interesting and instructive. It shows him that wonders never cease in the engineering line, and that it is truly the engineers who, though mostly unrecognized by the general public, are the men doing the most for the public comfort, enjoyment and very sustenance in every way.

A New Hand Planer and Jointer.

THE new Oliver Hand Planer and Jointer has been designed to meet the demands of a class of customers who recognize in the *best* the *cheapest.* To produce it, neither skilled labor nor material have been spared.

The Oliver Hand Planers and Jointers are used to plane smooth, or true up long or short pieces of lumber or timber, taking the same out of wind, making glue joints, planing draft on pattern makers' lumber, etc.

The bed is eight feet long and mounted on two cabinet columns, which allows it to set very firmly on its foundation, doing away with all vibration, also allowing the greatest foot room possible for the workman.

The hand-wheels for raising, lowering and tilting the rear table being on the front side of the machine, makes it most convenient for the operator.

The tables on all sizes are two inches wider than the knives of the machine and have a groove in the side for use in rabbiting.

The rear table is five feet four inches long, and is moved backward or forward by a cut rack and gear and is very strongly ribbed. The front table is three feet four inches long and constructed in the same manner except that it requires no rockers. The sliding frame upon which the front table rests is made in two parts and fitted with an adjustable screw so that a spring joint, or one that is slightly concave, can be made by allowing the outer end of the table to drop down the desired distance. The table may be quickly brought back to level without disturbing the alignment.

The sliding frames which carry the work tables, move in dove-tailed ways which are planed in the bed and are so fitted with gib screws that they can be easily withdrawn from the yoke, or cylinder, for convenience in sharpening or removing knives. To these sliding frames are bolted the shoes for the adjustment of the work tables, the rockers upon which the table rests, and also the screws and hand-wheels which raise and lower the tables for the depth of cut. The shoes or wedges, are tongued and grooved to the sliding frame and securely bolted. They also have large flat bearing surfaces and are gibbed by separate gibs running in slots which hold the work table securely to the sliding frame. These surfaces are all milled and accurately scraped and keep the correct plane, or level, of the table at all times.

The yoke or frame, which carries the cylinder is made in one solid piece and bolted to the bed. This is a very desirable feature.

The cylinder is made of forged crucible machinery steel and is 3½ inches square, carrying two knives with the other two sides slotted for the use of extra knives of any shape desired, and should run about 4200 R. P. M., being tested in factory at a speed of 5500 R. P. M. for a period of ten hours. The diameter of the cylinder bearing is 1¾ inches, two main bearings 8 inches and the outer bearing 6 inches long, give a large and generous wearing surface, and are supplied with oil from a reservoir beneath each bearing in the yoke. The cylinder has about 3-16 inch of oscillation, or end play, which may be taken out by setting the driving pulley against the end of the bearing. This is necessary when special cutters are to be used.

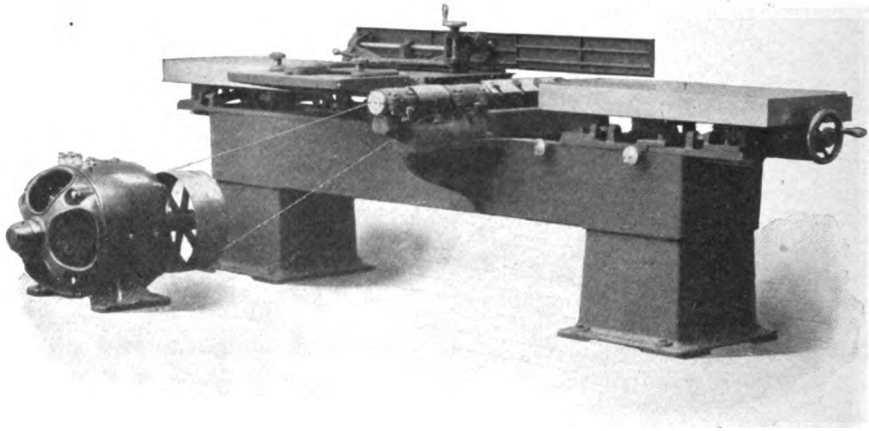
The fence is five feet long, five inches wide, very stiff and rigid, consisting of a slide which is bolted to the top of the work table and may be moved backward or forward the full width of the table without change. It may also be set at any angle from square to 45 degrees with a worm and worm-wheel. This device gives a very sensitive and accurate change of angles. When the fence is not in use

it rests upon the bracket, leaving the full width of the table in the clear.

Electric motors of standard types are furnished to drive these machines if desired.

One of the distinctive features is the tilting device. By means of this the pattern maker can obtain the draft upon every straight piece of wood that passes through his hand. This one point alone adds exceptional value to the machine for this particular work.

The tilting device operates the rockers upon which the rear table rests and by means of a hand-wheel and screw the table may be adjusted to give the required



taper, or draft, to the work. In order to obtain draft over full width of table it is necessary to gradually lower the rear table upon the shoes and plane the material several times until the full length of the knives is in use. Upon stock less than one-half of the width of the table this is not necessary. Very sharp or acute angles of any degree desired may be obtained by the simple repetition of the above operation.

The countershaft is 1½ inches in diameter, 3½ feet long, carrying tight and loose pulleys which have a 6-inch face and 10 inches in diameter.

There is something beside the price to recommend these machines, and one of the particular points is the fact that the rear table tilts so that draft may be planed on pattern lumber. There is twice as much material in the machine as there is in the ordinary hand jointer; in fact a little more than twice as much, and there is a great deal more hand labor and machine work. There are oceans of work in the ordinary pattern shop too large for a 16-in. or 20-in. hand jointer and this is made up to 30-in. For instance, suppose a pattern maker had a partially completed pattern composed of a good many pieces glued up and he wanted to true up the face, a large machine for this class of work is simply invaluable. It does not take any more power, or much more room to put in the large machine, and then you are always prepared to do the largest work. Another good point about it is the fact that if anything ails the boxes or cylinders, the entire yoke may be unbolted from the frame and sent out to a repair shop or carried to a more convenient place in the shop for re-babbitting.

For the up-to-date pattern shop, car works, cabinet shop, furniture factory and planing mill, where high-grade work is the chief requirement, this machine will save a great amount of hand-labor.

Button Making, a New Old Industry.

BY KILBOURNE COWLES.

ONE day about twelve years ago a German button maker named Boeple wandered into Muscatine, Iowa, fresh from the old country.

He saw for the first time the mussel shells of the Mississippi River and expressed the opinion that they were good material for buttons. Local capitalists were not slow in recognizing the possibilities of a new industry, and soon established a factory for the manufacture of buttons. From this beginning the industry has spread both up and down the river, and many towns are engaged in the profitable business of button making from these shells that hitherto were regarded, if at all, as entirely useless and not very ornamental.

Of the forty or fifty varieties of the mussels, the most desirable is that known as the "niggerhead." Some kinds are too brittle to be put through the machines, others too thin, still others too thick, so that great care must be exercised in their selection.

The manner of catching the mussels is an interesting procedure. A fisherman equips himself with what is known to the clan as a "John boat." This is a flat boat on the order of a scow, about twenty feet long and three and a half feet wide. Upon the inside of the boat are placed eight uprights, which are between three and four feet high and have crotched tops. Four of the uprights are placed on each side of the boat at just enough distance apart to accommodate the four ten foot pieces of an inch gas pipe that rest upon them. To each of the gas pipes is attached twenty-four-foot stagons, similar to those used on an ordinary trout line, and each stagon has four hooks with four prongs.

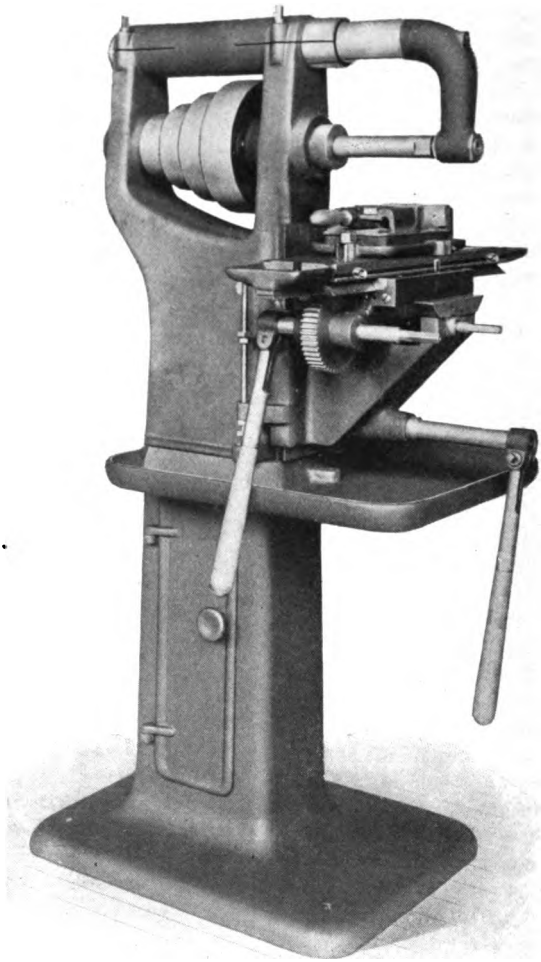
Once in the stream he casts his gas pipes, one by one. As the hooks drag along the bottom of tue river they come in contact with the open shells of the mussels, which immediately close up on them. Thus attached they are brought to the surface and taken off. The number of mussels brought up each time ranges from forty to seventy.

The men sell the mussels to the button factory operators at so much per 100 pounds. The wages they make depends upon their diligence and the luck they meet with in getting in a thick bed, but range from $1.50 to $5 per day. Before the shells are ready for the button makers the mussels first have to be boiled in order to separate the meat from the shell.

The process of making the shells into buttons is interesting. The shells are first cut up into blanks the exact size the buttons are going to be; then they go to the grinder, a machine which grinds the black back off of them; after that to the facing machine, which cuts the face on them; next to the backer, which bevels the back; then to the drill, which puts in the eye holes; from here they go to the polishing room, where the glossy finish is put upon them; after that they are sorted, put on cards, and boxed up.

There is an added interest in the business of mussel fishing on account of the likelihood of finding pearls. It is not an uncommon thing for a fisherman to find a pearl valued at $100, and one lucky fellow found a beauty which sold for $5,000. Every follower of the business has a little bottle filled with specimens, which eventually find their way to the finisher and the market from the professional buyers who travel up and down the great river.

After the shells have had the button blanks sawed out of them they are used to make walks around residences, and they serve admirably for this purpose. In other localities they have been used successfully for making roads, notably in New Orleans and Galveston.



The Chicago Hand Miller

(See description on page 9)

The Chicago Hand Miller.

THIS is the hand miller we consider such a fine tool. It has the trade mark "Chicago" on it.

Hand millers, as built heretofore, have been all right in their way, but they didn't weigh enough nor did they have the range and capacity proportionate with their size. The "Chicago" Hand Miller is different; it is substantially built and has an unusually large range of motions to the table.

The longitudinal motion to the table, obtainable by a crank on the side, is 15 inches, or the handle operating more rapidly gives 7 inches. Adjustable stops are provided in this direction. Transverse motion to the table is 4 inches and the vertical movement to the knee is 7 inches. This latter is obtainable by means of the handle shown, and stops are provided to hold the knee in any desired position. It is counterbalanced by a weight inside the column.

By this it will be noted how liberal are all the proportions. The working surface of the table itself is 20 by 5 inches.

The bearings are self-oiling and dust-proof, needing attention only at long intervals. They are the same that are embodied in the other "Chicago" products and are always in perfect order. No oil creeps out along the spindle, and dirt cannot work in, while at the same time you have the satisfaction of knowing that the proper amount of oil is constantly upon the bearing surfaces and that the lubrication is perfect.

The spindle is of steel and hollow. It is also threaded on the end to receive a protecting nut, or chucks and face mills, when desired. This is a noteworthy feature. This thread also serves to force the arbor out of the taper hole in the spindle, which is a great convenience. A finished arbor is furnished with each machine. Please note this also, as it is unusual with hand millers.

The knee is of box section, the strongest form it could be made, and is very rigid with the minimum of metal.

The socket for the overhanging arm is cast specially with a sleeve to receive a vertical spindle attachment. Think of a vertical spindle on a hand miller! But it's this sort of thing that turns out the work.

A large pan is on the column extending out far enough to catch all chips and drips. The levers are made with wood handles, being pleasanter to work with. The crank fits all around the machine.

Each machine is fitted with a special quick acting vise operated without any screw. Just shove the handle over to tighten it up, and loosen a nut when different sized pieces of work are to be inserted. There is a little oil pan cast all around the vise so that it sets on the table clean and dry.

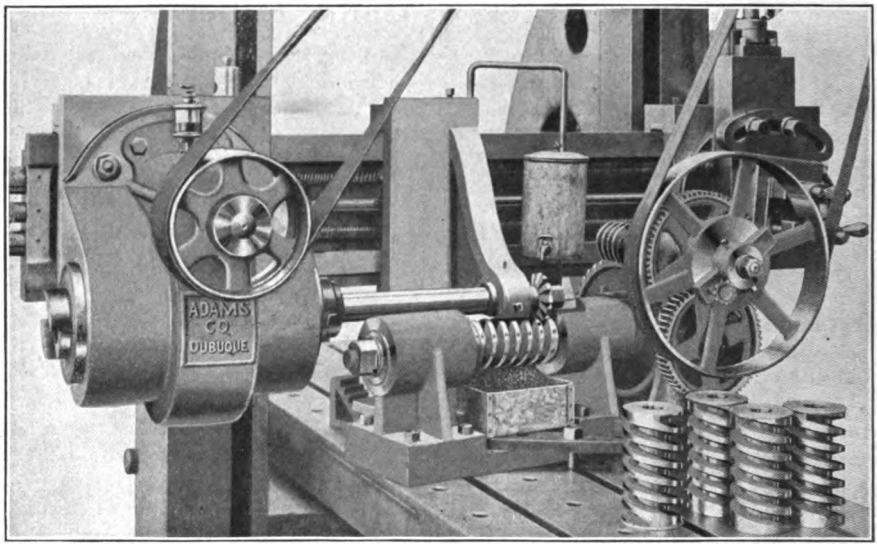
A "Pullet" countershaft goes with the outfit. Pull to start, and pull to stop. You don't know how handy one is till you have tried it.

The machine is made as simple and convenient throughout as is consistent with good design and large capacity, and we also feel that in addition to this, we have been especially successful in producing a very handsome looking machine tool.

Another Way to Mill Worms.

THE Farwell Milling Machine attached to a planer, is capable of many operations, one of which is shown on the next page. This represents the miller attached to a Gray planer milling large steel worms.

A cast iron lead screw causes the blank to advance at the proper ratio, as it revolves. The worm shown is a double one, and after the first thread is cut, a nut



MILLING STEEL WORMS WITH A FARWELL MILLER, ON A PLANER

is withdrawn by pulling out a key which allows the lead screw and blank, which is keyed to it, to be revolved half way. The nut is then engaged with the other thread of the lead screw.

In cutting a single thread worm, there would, of course, have to be a single thread lead screw, and this changing of the nut would then be unnecessary.

Before using this device, the company had some difficulty in getting these worms made, as a double thread worm of this pitch makes hard work for a lathe carriage, on account of the rapid travel it has to undergo. By using this milling machine, the cost of manufacture is now much decreased from what it would be on a lathe, and in comparison to what they would cost by buying a special machine, the cost is very small.

To Save Time and Temper.

THAT'S what Greenerd Arbor Presses are for. To save the time and temper of the man in the shop. Also to prevent arbors being all beaten up with a hammer on an anvil so they are useless for future work. This arbor press sets the mandrel home in its place with one motion, and forces it gradually and surely out when the job is done, just as easily and quickly.

They are made in all sizes, from eight inches high to go on the end of a lathe bed, up to sixty-eight inches high, weighing 2,000 pounds, and their capacities are proportionate to their sizes.

If you ever used one you would never be without a complete equipment, for the annoyance that is saved would fully repay you for the price of one, to say nothing of the arbors, time and work lost in the old way by battering.

When you are buying a lathe don't forget the arbor press, any more than you would neglect to buy a chuck, and if you are not buying lathes now-a-days, get an arbor press, anyway—Get a Greenerd.

NEWS & NOTES

ENGINEERS in the employ of the Southern Pacific Railroad have submitted reports to President E. H. Harriman for the construction of a tunnel 34,800 feet (or nearly seven miles) long through the Sierra Nevada Mountains at a cost of about $14,000,000. Such a tunnel will cut down the summit grade about 1,500 feet, and will enable the company to get rid of all but three of the forty-two miles of mountain snowsheds.

It is intended to construct and equip a rapid transit system upon the World's Fair grounds, St. Louis, which will enable the visitors to see the vast Exposition with as little fatigue as possible. The problem seems to have been solved in placing it where it would not mar the beauty of the Exposition, for owing to the various altitudes of the Exposition grounds the road will be at times an elevated line and in other parts built at grade or below the surface.

The work of enlarging the Milwaukee & St. Paul Railway Company's shop plant at West Milwaukee is progressing, and the sixteen-foot concrete foundation for the monster smokestack for the new power house is completed. Erection of the stack has begun. The building of the power house will remove the two old houses and substitute a central plant, and when it is completed the small machines in the shops will be grouped so that when a group is idle the power will be shut off and it will not be necessary for all the shafting to be driven all the time, making a saving of 33 to 50 per cent of power.

The National Malleable Castings company, of Chicago, has augmented its recent purchase of property of the former Grant locomotive works in Cicero by purchasing from the receiver of the National Bank of Illinois a tract of 629x633 feet at the southwest corner of Twelfth street and West Fifty-second avenue, Chicago, for $20,000. This tract of about ten acres adjoins the first purchase on the north and gives the company a continuous tract of thirty-eight acres.

Stanley Spencer, the aeronaut who created a sensation several weeks ago by his successful flight in a dirigible balloon over a greater part of London, took a flight in his airship at Blackspool, England, a short time ago. He rose to an elevation of 1,500 feet and sailed away, his ship apparently under perfect control. A heavy breeze was blowing, but it did not seem to interfere in the least with the balloon's progress. He sailed twenty miles, returning to the starting point, where he alighted safely.

Sometime this month the longest submarine telephone line in the world will be opened between England and Belgium. The principal part of the cable has already been laid, terminating on the English side in St. Margaret's Bay, near Dover, and on the Belgian side in the little harbor of La Panne. It now only remains to make short connections. The length of the cable is sixty-three miles; it is on the double circuit plan, and cost about $5,000,000, while its complete installation will take nearly twice as much. The entire enterprise was conceived and has been carried through by the General Post Office of London.

A New Filing Machine.

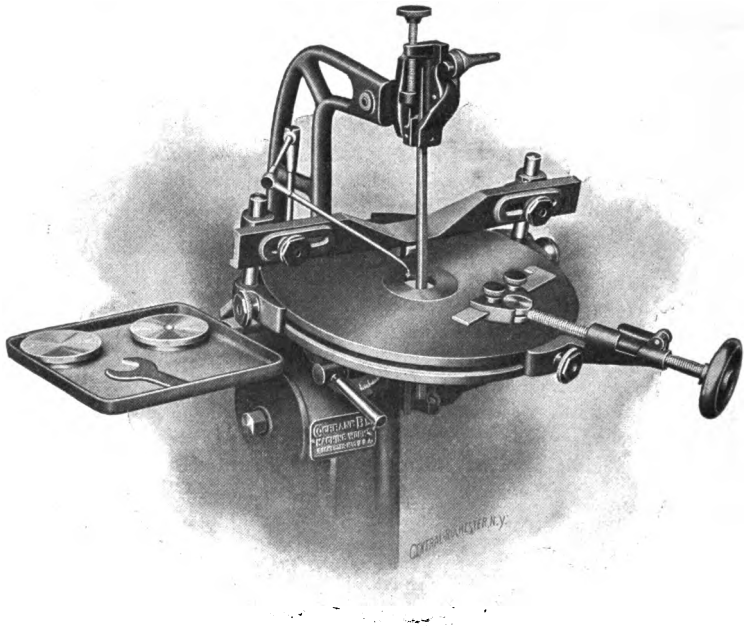
THE Cochrane-Bly filing machine is a money-saver in die filing, hack-sawing, light slotting, and a variety of work in many branches of manufacturing.

When used for die-making, the desired sheer is obtained mechanically and is mechanically exact. Manufacturers using them can employ a cheaper class of labor, as a handy man who knows enough to set the table by the graduations, cannot very well help getting the right sheer.

With the machine, he stands a better chance of avoiding rounded edges and of getting a true, flat surface and exact angles, than a skilled die-maker, working by hand and eye. But the same man, whether handy man or skilled die-maker, accomplishes so much more, after becoming familiar with the machine, that he effects a net saving of from 10 to 30 per cent.

The file clamps are made to take any file from the smallest up to ½-inch thick. Saws are instantly adjusted on pins on the file clamps.

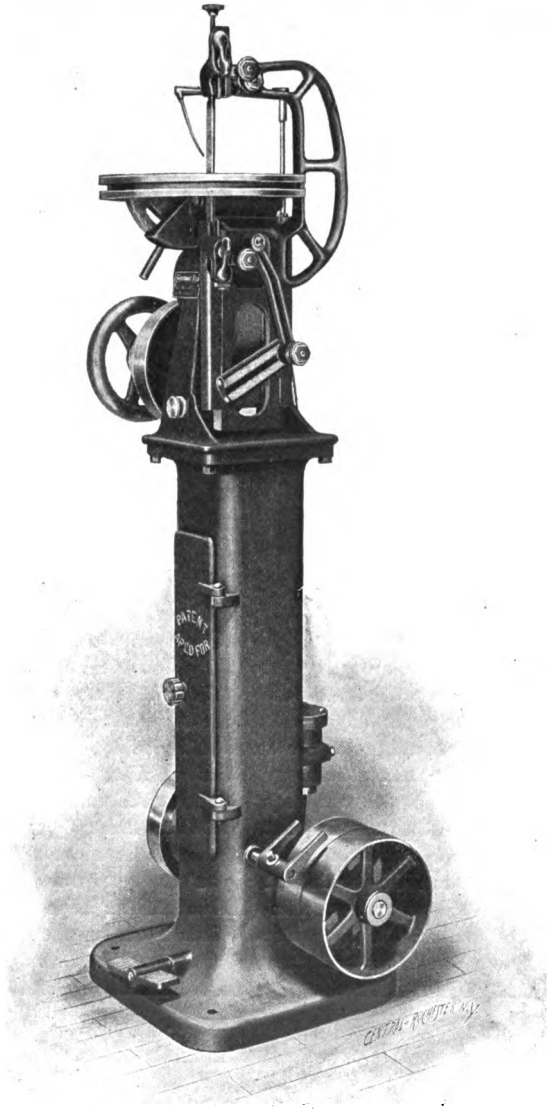
Clearance is provided for the file whereby it is held clear from the work on the return stroke. The file may be made to cut on either the up or down stroke by changing the crank pin to the opposite end of the crank arm. The amount of clearance is adjustable from 1-32 to 0 by means of a knurled headed screw at the front of the frame.



Graduated readings are provided by which the machine can be set to file at any angle with mechanical exactness. It files a straight and true surface.

A screw feed, operated by hand, is provided, by which the work can be fed to the file in any direction on the table.

An adjustable strap is provided to hold the work down to the table. This is especially useful in sawing and heavy



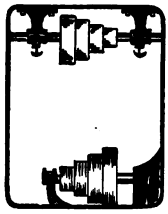
filing.

An air pump is provided to blow away the chips and filings, by which the work and file are kept clean, insuring a smooth cut.

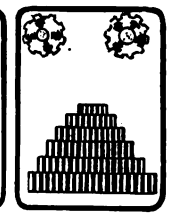
Hardened dies, guages, etc., can be lapped much faster and truer with the machine than is possible by hand.

Four changes of speed are obtainable, from 60 to 450 revolutions.

Manufacturers can construct their dies with less sheer and the less the sheer the less waste or impairment by sharpening. The die lasts longer.



EDITORIAL SHOP TALK

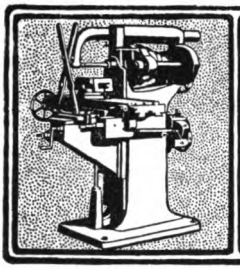


LAST month we put in each copy of SHOP TALK a stamped postal card with a few questions on it, and this card was addressed so that it would return to us if dropped in the letter box. Some people didn't bother to take a minute or so and do as we asked them to, for not quite so many cards came back as went out. Don't know what they did with the stamps—soaked them off, maybe, but they're only one cent ahead, and we are short a little information and courtesy. It wasn't really much trouble to write "yes" or "no" on the postals, either.

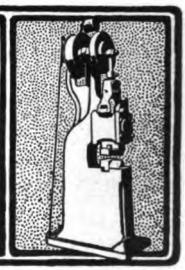
A lot of people did do it though, and were frank enough, some of them, to tell us they didn't want the paper any more, being out of business, retired or not in our line. We are grateful to have them say so, too. Lots of other people said very nice things about SHOP TALK and want it some more all the time, and some folks we were able to accommodate with just what they wanted in the way of machinery. That did us both good, for we're pleased to get a new customer and they are sure to be pleased with a machine we sell. This is just a little editorial chat with you all,—about the only chance we get to talk with some. And say—if you have that stamped and addressed postal card lying around your desk anywhere, why this is a reminder that we want to know how you stand about SHOP TALK. That's why we had cards printed, that's why we had them addressed, that's why we put a stamp on every one, and that's why we sent one to each of you. Don't have to spend a cent—just spend a little thoughtfulness.

The water grinder we talked about last month on this page is not numerous enough to be advertised yet. We want a lot of them in stock before we tell about them, for the proverbial "hot cakes" that are beginning to take notice about this time of year, wouldn't be assimilated any faster than these new Chicago grinders will be when they come out. And we are going to have two sizes instead of one, so you'll have to wait another month. The Hand Miller kept his word and shows himself on another page of this issue, however. Seen him yet?

A fleet of the biggest steamers on the great lakes, whose total cost will exceed $10,000,000, is to be built for the United States Steel Corporation through the Pittsburg Steamship Company, which represents the "steel trust" on the lakes. The capacity of the American Shipbuilding Company, which is to make the big ore carriers, will be tested to the utmost during the coming year and the spring of 1904. Competition by independent ore vessels, which has heretofore been permitted, is to be wiped out by the combine



The BARGAIN LIST



Some are new machines that we own cheap, or are special machines not required by every shop, and which, rather than keep standing on our floors, we are willing to sacrifice to gain the room for faster-moving machines. Others are second-hand machines which we have acquired in trade and through the divers exigencies of business.

PLEASE WRITE FOR PRICES—which, in all cases, will be found interesting and, like as not, absolutely unmatchable.

List of Second-Hand Tools in Chicago

SECOND-HAND LATHES

One 15"x5' Stud Lathe.
One 30"x15½" New Haven Lathe.
One Fitchburg Lathe. 15"x5'.
One 14"x5' Engine Lathe.
Two 14"x5' Putnam Engine Lathes.

SECOND-HAND DRILL PRESSES.

One Pawling & Harnischfeger Horizontal Double Post Drill, with 7-foot vertical movement, table 48"x60", and 15 feet of track, good condition.
One 22-inch Prentice Bros. Adjustable Head Drill.

SECOND-HAND SCREW MACHINES.

One ½" Wells Bros. Automatic Screw Machine.
One No. 3 Bardons & Oliver Screw Machine, plain head, wire feed and automatic feed.
One No. 2 Bardons & Oliver Turret Machine, plain head.
One No. 3 Bardons & Oliver Turret Machine, with wire feed.

SECOND-HAND MILLING MACHINES.

One No. 24 Brainerd Miller, with centers.
One No. 3 Garvin Miller, with centers.

SECOND HAND PLANERS.

One 31"x31"x8' Planer with extension for 12-ft. bed. One head.

SECOND HAND SHAPERS.

One 24" Hendy Shaper.
One Traverse Head Shaper.

SECOND-HAND GRINDING MACHINES.

One 24" Bridgeport Water Tool Grinder.
One 36" Springfield Water Tool Grinder.
One B. & S. Small Automatic Surface Grinder.

SECOND-HAND WOOD-WORKING MACHINES.

One 24" Hodge Railway Cut-off Saw.
One Berry & Orton Wall Saw.

SECOND-HAND SUNDRY MACHINES.

One Fisher Boiler-Plate Chipper.
One No. 2½ Pratt & Whitney Cut-off Machine.
One 5" Star Cutting-off Machine.
One 2" Hurlburt & Rogers Cutting-off Machine.
One No. 34 Toledo Power Press.

SECOND-HAND CHUCKS.

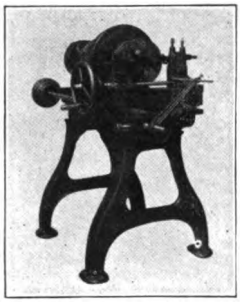
One 10" 4-jaw Union Independent Chuck.
One 9" 2-jaw Cushman Chuck.
One 6" 2-jaw round body Cushman Chuck.
One 10" 2 jaw box body Cushman Chuck.
One 6" Horton Cutting-off Chuck.
One 5" 2-jaw Chuck.

Hill, Clarke & Company,

Machinery Merchants.

BOSTON: at 156 Oliver street.
CHICAGO: at 14 South Canal street: with a model demonstration machine shop in operation.
NEW YORK: at 123 Liberty street; office entrance, 153 Greenwich street.

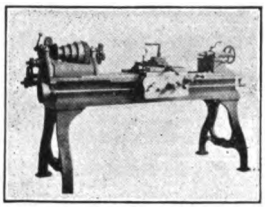
WATCH THIS SECOND-HAND PAGE



These cuts are from the actual machines photographed in our Chicago store, and the description is complete. If you want the machine, say so quick.

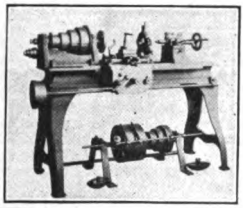
H. & R. 2" Cut-Off Machine

Old style, in excellent condition. Two Cushman chucks in first-class order. Machine has a stock support, and equipment includes two cut-off blades and holders. Chuck wrench missing, but otherwise machine is ready for business. Countershaft and all are complete..... **$75**



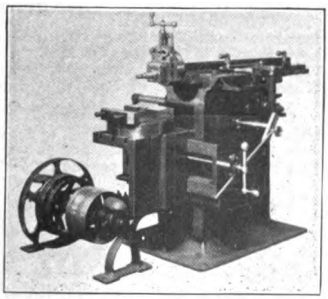
Fitchburg 15"x6' Lathe

Rise and fall rest, no power cross feed. Gear cover on left side of apron cracked, but working parts O. K. Feed reverses in apron. Lead screw on the back side; screw somewhat worn. Gearing throughout lathe in good order. Solid spindle. Double friction C. S. in good order; one hanger broken and repaired. Change gears all complete..... **$100**



15"x5' Plain Turning Lathe

Rise and fall rest. Carriage in first-class condition; gearing very little worn. Cross feed screw in fine condition. Feed reverses in apron. Face plate as shown in cut only. Four step cone for 2½" belt; largest step 9" diameter. T. & L. pulley C. S. with cone of wood but O. K..... **$80**



24" Hendey Friction Shaper

Old style machine in good condition. All parts complete; bearings, ways, etc., in good working order. Gearing very little worn. Swivel base vise with jaws in fine order. Tool post wrench and chuck wrench missing. All other parts present and accounted for..... **$250**

HILL, CLARKE & CO.
Chicago.

This department is intended to help the good man who wants a good job, and the good shop with a good job for a good man. There is no charge for the service.

In making your wants known tell us everything—we publish just enough to elicit responses, and withhold the confidential particulars to assist us in bringing the right parties together.

We shall act with the utmost impartiality in every instance; no favoritism need be expected; nor do we ask or expect favors. We wish to make SHOP TALK really valuable to everybody—this is a means; nothing more or less.

Applicants for positions should state age, whether married or single, experience and familiarity with various machines (this in detail), how long in present or last position, why out of it or wishing to leave, if willing to go to any part of the country, wages last earned and expected, references, etc.

Employers should specify very particularly what the man is wanted for, what wages they wish to pay, and highest limit under necessity.

Opening No. 17.—Foreman of machine shop wanted. Man from 30 to 40 years old, with experience and good judgment in getting out machinery. Address "Iowa," care of Hill, Clarke & Co., Chicago.

Application No. 48.—Position wanted as superintendent of machine shop; applicant is personally known to this office and can be strongly recommended. Address G. B. C., care of Hill, Clarke & Co., Chicago.

Application No. 56—Situation wanted as foreman of machine shop by a practical man with 10 years experience. Gasoline and steam engine work preferred. Have no objection to ordinary work. Can give the best of references. Address W. C. G., care of Hill, Clarke & Co., Chicago

Application No. 57.—Position wanted as foreman of small shop, or large shop on small work. by man 27 years old. 14 years practical experience as machinist and tool maker, and expert on screw machines. Can harden dies, etc., and knows something of designing. Wages expected $3.50 up according to position. References, Address C. E. N., care of Hill, Clarke & Co., Chicago.

Application No. 58—Position wanted as general foreman or supt. in moderate sized engine or machine mfg. establishment or in mechanical department of a R. R. by a man of 28 who has had an unusual amount of all around experience in mechanical lines on railroads. What would just suit him would be a position where he could be of service both in mechanics and agriculture. Best of references. Address E. O. P., care of Hill, Clarke & Co., Chicago.

Application No. 59.—Position wanted as foreman of repairs in large manufactory. 20 years' experience as machinist, foreman of repairs, and millwright work. Address I. M. C., care of Hill, Clarke & Co., Chicago.

Application No. 60.—Position wanted as tool and machine forger by first class mechanic, 43 years old, married. Can handle lathes, planers, drills, etc., and has run power hammer for a number of years. Can make all kinds of dies for same, and temper them. Reason for change —too small pay. Address E. B. F., care of Hill, Clarke & Co., Chicago.

Application No. 61.—Young man 20 years old, of good, temperate habits, wants position as mechanical draftsman. Has done considerable detail work and studied with International Correspondence schools. Good references. Salary to be determined by ability. Address G. D. M., care of Hill, Clarke & Co., Chicago.

Application No. 62.—Situation wanted by young man of 19, manual training school graduate, and has had two years experience tracing and detailing. Address W. B., care of Hill, Clarke & Co., Chicago.

Application No. 63.—Situation wanted as foreman of "screw job." Applicant is up-to-date on all kinds of hand and automatic screw machinery. "Yankee," 32 years old and married; strictly temperate. Has been very successful breaking in green help, and has had 7 years' experience as foreman with first-class firm. Wants to work for a young firm that would appreciate industry and attention to business. Address F. G. K., care of Hill, Clarke & Co., Chicago.

Application No. 64.—Practical machinist. 32 years old, 10 years' experience as foreman and assistant superintendent. Familiar with modern shop methods, power plants, heavy and light erection. Wants position and can give references. Address, J. F. A., care of Hill, Clarke & Co., Chicago.

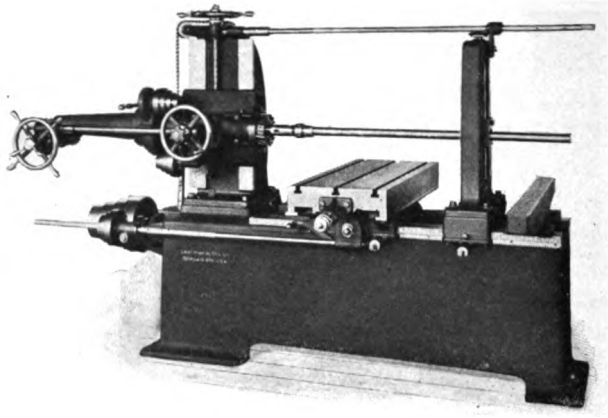
Application No. 65.—Young man of energy, with two years' experience with an eastern manufacturing concern, desires a position. References. Address H. C. D., care of Hill, Clarke & Co., Chicago.

NOTICE—*"Help Wanted" and "Situations Wanted" advertisements will be published under this heading, with address of advertiser (so that replies may come direct) at the rate of five cents per line, a line averaging about seven words. Advertisements with replies to come to our care will be published free of all charges including correspondence with the interested parties.*

A whole manufacturing establishment

is what you get in the

"Precision" Boring, Drilling and Milling Machine.



Built by Lucas Machine Tool Co.

and you get a guarantee that it will remain in perfect, permanent alignment, which no one else will give you.

Accuracy is the keynote of this machine.

That's the reason we now have so many satisfied customers to whom we would be pleased to refer you.

Hill, Clarke & Company,

Machinery Merchants,

14 So. Canal St., Chicago. Main Office, 156 Oliver St., Boston, 123 Liberty St., New York.

Pittsburg Representative, Chas. G. Smith Co., 347 Fifth Avenue.

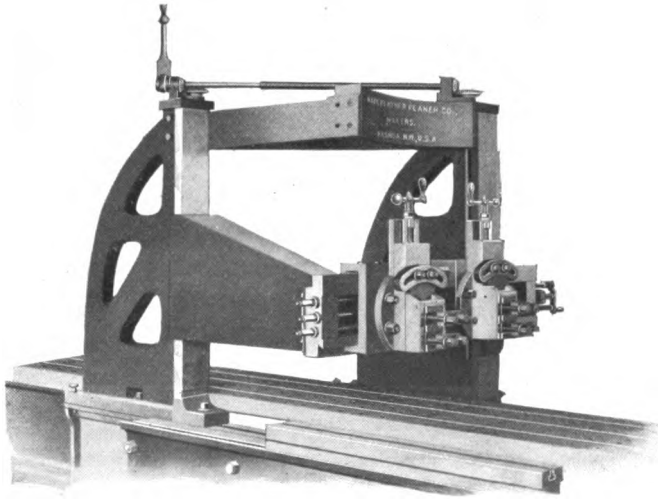
It is reported that the United States Steel Corporation is now making a canvass of the various steel-consuming concerns of the country with a view to ascertaining what their needs will be during the next half year. There is a two-fold purpose. The corporation desires to learn whether there must be expansion or contraction in production to meet demands, and also to determine how there can be the better distribution of products to meet the pressing needs of big consumers This will take in the question of transportation. This step marks the adoption of a new policy by the trust, which is intended to result in the systematizing of the business of steel making more exactly than it has been done heretofore.

"Shop Talk"

TWELFTH NUMBER OF THE SECOND VOLUME.
DECEMBER, 1902.

Flather Open-side Planer.

THIS cut illustrates a planer designed for Flather's own service, which proved to be such a convenient machine that it was decided to put it on the market. We believe the arrangement is much better than the ordinary open-side planer, in which it is impossible to overcome a certain amount of spring and chatter on a heavy cut, if the work for which the planer is to be used does not make it necessary to have it without any support for cross-rail on the opposite side from that which is ordinarily termed the "near side." The housing is so arranged that it can be moved back to any desired position, within certain bounds, being supported, as shown in the cut, in a very rigid manner, and an extension rod is provided so that the cross-rail may be raised or lowered with the housing in either position, without changing its accuracy. There is a suplementary table for supporting wide work. The change from a regular planer to an open-side can be made very quickly.



THIS SHOWS THE RIGID CONSTRUCTION OF THE PLANER.

The above arrangement practically makes two planers, the regular planer and an open-side planer, for a slight increase over the price of the regular planer, and it can be fitted with one or two heads on the cross-rail, one side head, and either angular or parallel drive.

The Hanna Pneumatic Screen Shaker.

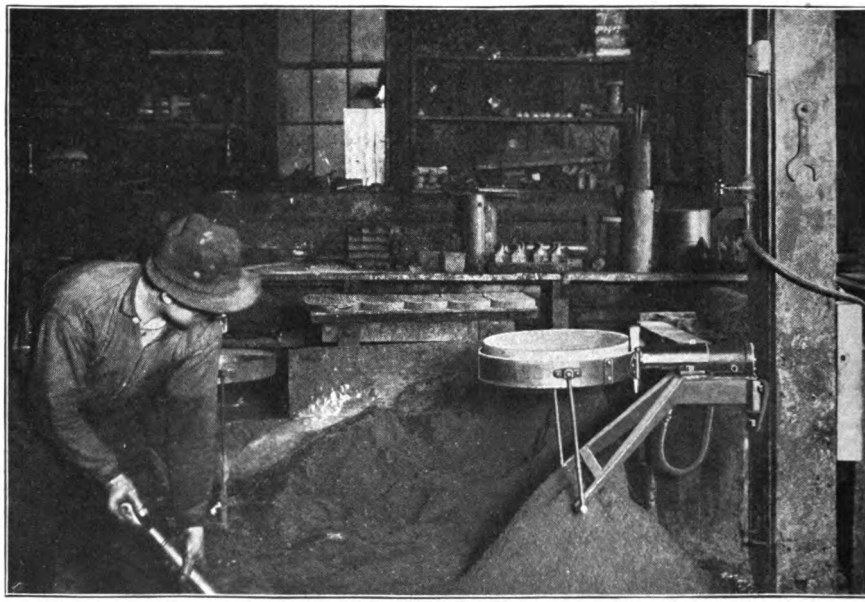
THIS machine has been developed to supply a means of easily and quickly running moulding sand through a riddle, in shops where the work is too diversified or uncertain to allow of a central screening, mixing and tempering plant.

Every good foundryman realizes the advantage of a thorough screening of moulding and core sands preparatory to their use in moulding, and he knows that for mixing sands and the necessary binding material there is no more expeditious or satisfactory way than shaking one or more times through a riddle.

The shaker is a simple arrangement of a valveless piston working in a cylinder, the piston directly attached to a holder which accommodates the ordinary 18-inch circular foundry riddle. The whole device is mounted either on a tripod or on a frame to be held by sockets fastened to posts or building walls. There is practically only one moving part, and no joints working under reversing strains.

This illustration shows the shaker attached to a post. This style weighs fifty pounds, and the portable one a hundred pounds. The idea of portability was firmly held to in designing the machine, as the economy of operation in moving and operating it just where wanted, is readily appreciated.

There are places in every foundry where there is almost constant use for a riddle, such as core room and facing bins, where the Post machine can be fixed up and used as a stationary machine to advantage.



PNEUMATIC SHAKER IN USE

The machine will use about 12 cubic feet of free air per minute, and is designed to work at 80 pounds gauge pressure. As a stationary machine, it is not necessarily run by air, but will operate equally well on steam. With a ½-inch mesh riddle it will keep two men shoveling.

The Design of Milling Cutters.*

T is well known that the introduction of the emery wheel for grinding milling cutters brought the process of milling at once into the front rank of machine operations. Crude forms of circular cutters which had given more or less dissatisfaction for generations, have acquired an interest from their position as forerunners of the modern tools which have worked such a revolution during the past fifteen or twenty years.

So much attention has now been given to the milling process, that in many cases a degree of perfection has been attained which apparently leaves little room for improvement. It is still true, however, that even in up-to-date shops the output is below what it might be. Some firms undoubtedly have developed milling far beyond the rest of the country, but as a whole there is no reason why milling should not continue to advance during the present decade, as much as it did in the past. It should advance not only in becoming more general and more widely applied, but also in the direction of giving better results.

Standard Styles and Sizes of Cutters.

It is now quite a common practice to use cutters which are not adapted to their work. The number of standard styles and sizes of cutters is already enormous, and neither the manufacturer nor the user can contemplate with equanimity the idea of a large increase, and yet the existing standards are inadequate for the great variety of work they have to perform. The ordinary standard cutter is intended to be used on cast or wrought iron, steel, or brass, and the recognized form has been evolved as the best compromise for varied work.

There are many special operations—where the work is flimsy—where the cutter passes through different metals at the same time, or through mica, or raw hide, or where any curious conditions arise; and the best form of cutter can only be arrived at by experiment on that particular operation. For an individual job it matters little that a cutter is not the very best design, but with repetition work it is serious to use a tool which is not capable of giving the best results.

Undercut Teeth.

A turning or planing tool for iron or steel has top rake, as well as clearance below, and milling cutters for many operations should have similar rake. On the table are shown some cutters for milling grooves in mild steel. The teeth are undercut and the pitch is coarse. They are intended to be used in a powerful machine at a slow speed and a heavy feed.

There are also shown some cuttings from steel shafts. These were produced in the works of Messrs. L. Gardner and Sons, Limited, by a cutter which was 3 in. diameter, 1¼ in. wide, with ten teeth undercut 10 degrees. The speed was 28 revolutions per minute, and the feed 1 in. per minute, with 9-16 in. depth of cut. This gives an approximate cutting speed of 27 ft. per minute, and a feed of 36 thousandths (0.036) per revolution. At this rate the cutter left a beautifully finished surface. It ran easily, and kept its edge well.

It must not be assumed, however, that undercut teeth are necessarily advantageous. Frequently they are the reverse. Mr. E. G. Herbert, of Manchester, has recently made a series of tests with 3 cutters 6⅝ in. diameter, 9-32 in. thick, with 1 in. hole. In each case there were 30 teeth, which in one cutter were radial and in the other two were undercut 10 and 15 degrees respectively. The cutters,

*Extracts from paper read before the Manchester (Eng.) Association of Engineers.

running at 20 revolutions per minute, or a cutting speed of 42 ft. per minute, were fed separately into the vertical faces of heavy blocks, first of cast iron, and then of mild steel, until the machine stopped. The feeds varied from 1.4 in. per minute, to 0.16 in. and there was no perceptible slip of the feed belt.

The results of the tests were somewhat complicated, and the curves plotted therefrom were full of interest, but they failed to show any decided advantage of one tooth over another. The general indication seemed to be that the advantage rested with the undercut teeth with a big feed, and the radial teeth gave better results with a fine feed.

From these experiments, and from general experience, it would appear that undercut teeth may often be used with advantage under the following conditions: The machine should be powerful, and the cutter arbor of ample size. The pitch of the teeth should be so coarse that only two or three may cut at the same time. The speed of cutting should be slow, and the feed sufficiently quick to allow each tooth to take a real cut. When these conditions cannot be fulfilled, there will probably be no advantage in departing from the usual form of tooth.

Slotting or grooving cutters, spiral cutters, and side mills are well adapted for undercut teeth. Formed cutters may be so made, but there is a difficulty with the form. Thus in Fig. 1, if the true form required is made along the cutting face A B, the cutter will leave a false form to the line A C. The difference is, in most cases very slight, and always may be allowed for in making the cutter, but variations in grinding the face will alter the form. It is easy in grinding to see when the faces are radial, but it is not so simple to give a known amount of rake.

End Mills.

The question of undercut teeth also arises in the case of end mills. Three methods of cutting the teeth are shown in Figs. 2, 3, and 4. Fig. 2 shows an ordinary spiral end mill with right hand teeth and left-hand spiral, by which arrangement the pressure from the work always tends to push the cutter into its socket. This is the correct form if the cutter is to be used for milling on the sides, if, strictly speaking, it is not to be used as an end mill, for which it is unsuitable, because the teeth on the end have negative clearance and would not cut freely. For end cutting, the ordinary straight teeth shown in Fig. 3 are more suitable, and in some cases a right-hand cutter with a right-hand spiral would be best of all (see Fig. 4). This gives correct clearance to the end teeth, and when used under favorable conditions such a cutter has no more tendency to leave its socket than a twist drill, which is made on exactly the same principle.

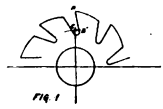


FIG. 1

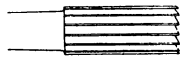
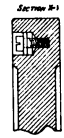


FIG. 3


FIG. 2


FIG. 4



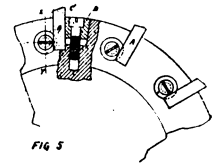


FIG. 5

Side Clearance.

Standard cutters frequently give trouble in the matter of side clearance. It is assumed that the cutter must not lose its width on resharpening, but there must be some dishing on the sides, or it would be unworkable; accordingly, a very slight clearance is given, say ½ degree each side, which will cause the cutter to become two-thousandths (0.002) thinner when

¼ in. has been ground away in diameter. The cutter would be more serviceable if it had, say, 1 degree clearance each side, but that would cause it to lose its width too soon. Now suppose a quantity of work is required where the width of groove is not particular to one-fiftieth (0.02) of an inch, or where the cutter is only used for roughing, it would be worth while to take a standard cutter and grind extra clearance on it. This is particularly the case when cutting brass, which is very liable to bind on the sides.

Inserted Tooth Cutters.

A development should take place in the direction of cutters with inserted teeth. All users must have been fascinated with the idea at some time or other. The obvious advantages are:

1. That cheap material may be used for the body of the cutter, and the very best steel for the blades.

2. Hardening difficulties are reduced to a minimum.

3. When worn out the blades may be replaced at a small expense.

The great objection is the first cost, particularly in the case of cutters less than about 7 in. diameter. Also inserted blades are usually not very suitable for wide cuts. The superiority of the inserted tooth cutter is most unquestionable in the case of side or straddle mills which are mainly cutting on the corners.

One widely used method of holding the blades is shown in Fig. 5. The blade A is ground on the sides, on a magnetic chuck. The bush B is turned parallel and has a flat milled on it at an angle with the center line. This bush, which fits in a recess, as shown, is simply a wedge and is knocked in. There is a screw C to prevent it coming loose. A second screw D, the patent of Mr. W. S. Baskerville, is shown for adjusting the blades sideways. There seems to be no reason why these cutters should not largely displace solid side mills, except in the smaller sizes.

Conclusion.

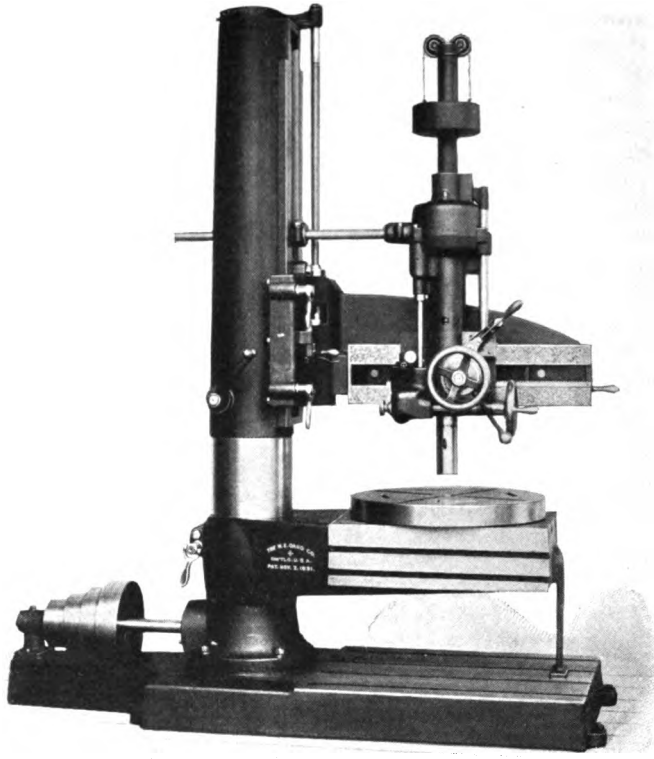
Returning to the general subject, one cannot but feel that milling cutters still have great possibilities before them. Better cutters, heavier machines, sufficient grinding, and the things that they have done are but an earnest of the things that they will do.

A Good Plain Radial.

THIS is the latest form of Gang Radial Drill, fitted with a square table and circular table attachment. The frame parts are well proportioned and the machine is very stiffly constructed throughout.

The lower end of the column is turned to fit in the stump, allowing the arm to swing through a complete circle on its ball bearing. The upper end of the column has a flat seat for the arm, is planed with dovetail flanges at the edges of the arm seat, and back of these again are flat seats for the clamps, which hold the arm in position and also take up any wear incident to raising and lowering the arm. Two screws with handles attached, working in nuts beveled to fit the edges of the arm seat, both clamp the arm and align it vertically. Any tendency to spring the column in clamping the arm is overcome by fitting a square gib in the opening provided for vertical movements of the horizontal driving shaft.

The arm is of box section, well ribbed, and is raised and lowered by means of a stationary screw, a revolving nut and tumbler gears, the movement being controlled by the small lever shown directly between the clamping screws. The head is provided with an ample number of feeds by hand or power, a quick return movement for spindle, and is traversed



NO. O. GANG RADIAL DRILL

along the arm by means of rack, pinion and the handwheel at the front.

To concentrate all heavy stress of driving at the spindle, three large gears—for ordinary drilling, for heavy boring and tapping, and for reverse in tapping – are placed directly on the spindle. The back gears are just behind them. The upper part of the head is made to entirely surround these driving gears, thus eliminating all attached bearings, affording an excellent protection to the working parts and insuring the workman against injury. A lever at the right of the head enables the operator to quickly start, reverse, connect or disconnect the back gears.

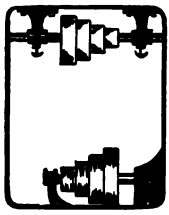
A friction feed is provided and any desired change is obtained instantly by turning the knurled knob at the left of the head.

Any one of four styles of table—a round table, a plain square table, a plain swivelling table, or a worm swivelling table can be furnished with this machine, or the combination of square and round tables like the one here shown may be had for a small extra charge.

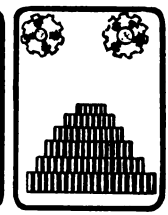
The base is so designed as to give ample strength and stiffness, to provide plenty of working surface, and to occupy no unnecessary floor space.

The machine is provided with eight rates of spindle speed. Others may be added to cover special cases.

It is a good plain radial drill.



EDITORIAL SHOP TALK



Merry Christmas to everybody!

Consult our Stock List on pages 16 to 20. We probably have what you want.

The generous thought is often more appreciated and longer remembered than the generous gift from hand to hand.

By the way, we have been quite generous to a good many of you readers. How many are in arrears on subscription? Only 50 cents for twelve numbers. Yes? No?

Look on page 13 if you want to see a wet grinder to please you. It's the one we have already made you interested in by talking about beforehand. How would you like one in your stocking?

Also look between the leaves of this number for your opinion printed on a little slip of paper. Isn't it your opinion that SHOP TALK is worth 50 cents a year? Well, then, sign your name and put your address on this slip, so you'll be square with yourself—and us.

We have a little scheme evolved for your convenience in remitting. This is it: Send in your signed opinion slip, saying you approve of the appearance of SHOP TALK, and believe it to be worth 50 cents a year. Never mind the money that trip, unless you want to send stamps. Then we will send you a coin card to put your half-dollar in, so that you can mail it to us easily. That isn't any bother, is it? All you have to do is to say you like the paper enough to pay for it, and we furnish you the conveyance to transmit your convictions in the shape of a half-dollar. Stamps are all right, though, if you prefer sending them.

SHOP TALK a catalog? Well, we guess not! Wait till you see a real catalog, such as we are now working on. One or two crusty old bachelors (we suppose they must be bachelors) sent in word they could get catalogs for nothing, inferring unkind things about SHOP TALK. No, sir! it's a magazine, and we haven't room to publish the sincere words of commendation which we have received for it as such. We tell about our own tools in it, of course, but do not forget that we tell about other people's, also. We have generally found mechanical men want to know the latest tools and developments in the machinery line, hence we show new tools as they appear, only we seem to have more new things and better ones than other people. Don't you wish to know about the latest and best? Then read SHOP TALK. Do you wish to read articles on shop practice and the care of and design of tools? Then read SHOP TALK. Are you interested in general engineering projects? SHOP TALK tells about them. Don't you yourself believe it is worth the small sum of fifty cents for twelve copies? Well, then, say so on your little slip and let us hear from you.

What a world of possibilities lies in the two little words "next year!" How many things the twelve months may unfold! We cannot look beyond the veil into the coming events of another busy year, but we can glance back along the vistas of the past and gather strength for new battles to be fought and won.

A Gas Engine Trouble.

BY ALBERT STRITMATTER.

"SAY, Mr. Weston, order another half-barrel of gas engine cylinder oil, will you, please? We are almost out again."

"Well, what's the matter with that oil we've been getting? It doesn't seem to last as long as it used to."

"I know it doesn't. But it is the same kind of oil and the one the engine manufacturers recommended. It used to keep the engine running just as nice as one could wish, but now it doesn't do so well, for I have to use more oil or the engine gets too hot. There seems to be something the matter with the engine, too. She doesn't run as easy as she used to. Acts sort of overloaded. You haven't been putting more load on her without my knowing it, have you?'

"No. We haven't added any more load, and if anything, the load is less. I noticed the other day, however, that the engine didn't pull as well as she used to. I had all the bearings in the shop oiled since then, and had one of our best machinists examine the shafting to see if any of it was out of line, so as to make a heavier pull. But everything seems to be all right. Perhaps we had better send to the factory for an expert, to see what's wrong."

"I wish you would, Mr. Weston. I've been considerably worried for fear you'd think just because I wasn't an experienced engineer, that I had been careless and let the engine get out of adjustment. I've studied the instruction book carefully and read everything I could about gas engines, but I don't seem to be able to find the trouble."

In a few days the gas engine expert arrived. After looking the engine over carefully, he went to the muffler at the end of the exhaust pipe. This he found was almost clogged up with a dirty, gummy, oily grease. He took the muffler plates apart and put them into a fire so as to burn off this grease. Then he went back to the engine and drew out the piston. The piston rings were partially stuck fast with gummy grease. He got a squirt-can full of gasoline, and soaked up the rings with the gasoline so as to loosen them. Then he took them out of their grooves and cleaned the rings and grooves well with gasoline.

Next he examined the inside of the cylinder. The auxiliary exhaust port was stopped up with dirt. After this was cleaned out, he went to the head of the cylinder, took off the head and found that all the corners and crevices in the explosion space were filled with the same deposits of gum and dirt. These were all cleaned out and the igniter points were also cleaned off and well scoured. Then the expert took out the exhaust valve. The valve stem, seat, etc., were found to be gummy and dirty, and these were well cleaned with gasoline. Then the valve was ground into its seat with emery flour and boiled linseed oil, so as to make a tight joint. The fuel valve also needed some cleaning and grinding, although not as much as had been necessary with the exhaust valves. When the engine cylinder, valves, etc., had been well cleaned up, the valves were put back, the rings were put on the piston and the piston was put back into the cylinder and connected up to the connecting rod. Then the expert went to the cylinder lubricator on top of the engine and examined it.

"Here," said he, to Mr. Weston and the engineer, "is the cause of your trouble. The only thing the matter with the engine was that it was dirty. It was just like a large city would be if the outlet of its sewers were stopped up. Now you see I have cut down the supply of lubricating oil just half. I'll start up again now so

you can get your shop to work and then I'll tell you more about this."

"Both of you no doubt noticed," he began after they had started the engine up, "that I really did nothing to the engine except clean out a lot of dirt and grease. I had to grind the valves because they had become leaky from the dirt depositing on their seats and not allowing them to seat properly. Outside of this I have done nothing to the engine.

"As I said before, the whole trouble has been in that lubricator feeding too much cylinder oil. You see, the engine needs a certain amount of oil in order to lubricate the piston and cylinder properly. If you feed less than this amount the engine runs dry, the piston and cylinder begin to heat, the piston expands faster than the cylinder (since it is farther from the cooling water) and pretty soon the cylinder is being cut and ground and finally the piston may expand so that it will stick and stall the engine.

"Now a great many engineers in order to avoid this trouble, do as you have done," pointing to the engineer, "and go to the other extreme. They say to themselves, 'Now I don't want to cut this cylinder all up, so I'll give her plenty of oil and be sure.' The result is that they give it too much and the surplus which is not needed to lubricate the engine is pushed back into the combustion space of the engine. Here it is subjected to the enormous heat resulting from the ignition of the charges. It is a very high fire test oil or it would not be able to lubricate the cylinder at all under such high heat, but when this surplus is collected in the combustion space it half burns and chars. The result is a deposit of carbon which mixes with the fresh oil and makes a greasy, dirty substance such as you have seen This collects on the igniter points, making the ignition uncertain and unsatisfactory. It also collects in the crevices of the engine, sticks the piston rings fast in their grooves, thus allowing compression to leak past them and thereby reducing the power developed. It further gathers in the exhaust passage, clogging up the ports, etc., sticks on the valves, and so on. You saw how the muffler was almost completely stopped up. Well, the whole inside of that exhaust pipe has that sticky, dirty grease hanging to it That's the reason I haven't put the muffler back on yet You had better let it stay off a few hours so that the dirt on the pipe will get burned and blown out. Then put the muffler back."

"I see now, said the engineer, "why the engine seemed to be overloaded. As a matter of fact it was not being overloaded, but it was not able to develop the same power."

"Yes," replied the expert, "that's just it. The internal friction of the engine was greater. Further, as the muffler and the exhaust ports were almost stopped up, the exhaust gases could not escape readily. This resulted in some of the burned gases remaining in the cylinder, and when the fresh charge of gas and air was brought in, these burned gases mixed with them and contaminated the mixture so that a strong explosion did not result. This also reduced the power of the engine.

"This is not an uncommon difficulty," he continued. "We frequently meet it, especially when an engine has been in use only about six months or a year, as yours has. But when once it is encountered and understood by the engine operator, he looks out for it in the future. You see this trouble would probably not occur to an experienced man, and although our instruction books call attention to the trouble, I find that even careful reading of the instructions does not always help the engineer.

"Well, I've got just half an hour to get my train. When you get the company's bill for this trip, don't feel sore, but just charge it up to experience and call yourselves lucky that it wasn't something worse. Goodbye."

The Chicago Wet Grinder.

UR aim in building the Chicago Wet Grinder has been to produce a simple, effective machine which will always be ready, always be efficient, and always be reliable. It's up to you to find out how far we have succeeded. We think we have done it, but still you may be able to tell us where to improve by buying one and using it continuously.

By a new and simple device, an even, steady flow of water can be obtained upon the wheel when it is running, and this flow can be regulated to the desired amount. The only action needed to control the water is to move the lever under the pan. There is no pump to become clogged up, nor any tank to get out of order. Just a little device, unique in its simplicity. One of those things that makes a fellow say, "Well, why didn't I think of that? It's so simple!"

The bowl is of generous dimensions, both in front and on the sides. This curving outwards at the sides allows a man to swing a tool 'way around without being hampered in any way, and without conducting the water on to the floor. It is so big and deep that the water can't be sprinkled out all around the machine. There is no slop with this wet grinder.

The bearings, like the rest of the "Chicago" tools, are self-oiling and dirt-proof. They are always oiled the right amount; there is no drip nor working out of the oil, and they need attention only at long intervals. Three or four times a year will keep them going perfectly.

A trueing device is located under the rest, so that it is always ready and in position when wanted.

The driving pulley is large and carries an unusually wide belt. The countershaft is the "Pullet;" pull the cord to start or stop. This only needs to be looked at once in a long while, too, and is prompt and quiet in action.

Plenty of cast iron is used in the machine, so it is rigid and free from vibration.

Now all these things are so, and can be proven, if you wish to try. And don't you think the Chicago Wet Grinder is a good looker?

We do.

An Improved Post Hammer.

AS there appears to be considerable demand for a power hammer of small size, to be actuated by steam or compressed air, the American Engineering Works, of Chicago, have designed what they term a post hammer, which they are building in two sizes, 100 and 250 lbs. falling weight.

These hammers are ordinarily mounted on wrought steel columns, but are arranged for mounting on wooden posts as well. The cost of the hammer is very considerably less than the cost of other forms of steam hammers with the same capacity, the 100-pound size being capable of handling any work up to 2¼-inch square or round, while the 250-pound hammer will handle anything up to 3½-inch square or round.

A special valve movement and treadle for handling these hammers is so arranged that a slight movement of the treadle causes the ram to rise to top of its stroke and remain there for any length of time desired, thus enabling the operator to adjust any work or tools on the lower die. If the treadle is then pressed down to the limit, the ram will give a hard, full blow, the same as a drop hammer; or, if desired, the treadle can be pressed down part way, when the hammer will give repeated light or hard blows, as may be required. The special valve gear permits one man to easily handle the hammer for drawing or regular forge work, or for die work, similar to drop forgings.

24-inch Chicago Wet Grinder.

(See page 12 for description.)

NEWS & NOTES

A MAMMOTH shipyard, to employ 8,000 persons, is to be erected at Sewell's Point, facing on Hampton Roads, and work is to begin at once. The shipyard is to be in operation in a year, and will have the largest dry dock in the United States.

Motor vehicle manufacturers are to call a convention of the trade at Chicago Automobile show in February, to take action toward the presentation of a bill in Congress providing for an appropriation of $20,000,000 toward a national highway. The feature of the bill to be presented and urged will be a proviso that the expense of the proposed highway shall be shared equally by the national government, the state and the county.

The Southern railway will construct one of the largest shop plants on the great system at North Birmingham, a suburb of Birmingham, and construction work will begin at once. Plans have been drawn for eight large brick buildings, each 100 by 400 feet, and thirty-five tracks of railway have been laid out. The shops will build cars as well as repair cars and engines for those divisions of the road in that section of the South.

An entirely new thing in boat building is in the course of construction at one of the yards near St. Louis, Mo. It is a boat which is designed to meet all the requirements of traffic in both deep and shoal water. The craft consists of two hulls, one within the other, each forming a perfect boat. The inner hull is of much greater draft than the outer one, and is lowered for deep-water traffic. This boat was especially designed for the trade between the Beaumont oil fields and St. Louis.

The Allis-Chalmers Company, Chicago, is preparing to make a large addition to its works at Elita avenue and the Milwaukee and St. Paul tracks. The addition will consist of a four-story machine shop, 120x360 feet, of steel construction.

The applications and multiplications of the various systems of wireless telegraphy are increasing constantly. Press dispatches record performances of vessels communicating with the land when from 100 to 1,000 miles out at sea, and many steamship lines are about to equip all their boats with wireless apparatus as a result of recent experiments. This offers a means of warning vessels of approaching danger, as well as furnishing instructions to sailing masters after their ships have left port, and before the conclusion of their voyage. It has been demonstrated also that messages may be transmitted to rapidly moving trains, with practically no serious obstacle, and this provides an additional safeguard to railway travel. Among the other projected applications of the wireless system is the standardization of time for all boats in the Atlantic, and also to keep in touch with the fishermen off the Newfoundland coast, who are ordinarily so entirely cut off from communication with the rest of the world in winter.