MAKING AN ENGRAVING BLOCK

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The old-time ball-vise or "sow-block," as it is known among die-sinkers, is scarcely recognizable in the beautifully finished engraving block of today, with all of its numerous adjustments and attachments; yet the rough old device with its rough-cast hemispherical-base and wooden pillow, was without a doubt the granddaddy of the present form. The engraving-block described in this article, was, as its name indicates, intended primarily for engravers' use only, but its usefulness to the tool- and die-maker will be at once recognized by those not already familiar with it, for while it will hold delicate articles without crushing them, it will also hold anything within the capacity of its jaws, as firmly as any vise made, and in any workable position. There is nothing weak or fragile about the tool even if it is a beautiful piece of workmanship.

There are two things that must be kept in mind by anyone making goods for jewelers' or engravers' use; first, such articles must be well made, and, second, they must be well finished. The block here shown certainly fills these requirements in every way. This block was originally designed by L. W. Géry, an engraver of New Orleans, and it is manufactured by Adolph Muehlmatt of Cincinnati, Ohio. Mr. Muehlmatt is a practical engraver and toolmaker of more than local reputation, who has from time to time added improvements as the demands of the trade or his own originality suggested them, and it is through his courtesy that we are enabled to publish the following article.

Mr. Muehlmatt manufactures two styles of engraving blocks: The regular and the keyless form, both of which with their attachments are shown in Fig. 1. The jaws of the keyless block, which is shown at the right, are operated by a knurled ring in a manner similar to an ordinary scroll chuck. The regular block is, when shorn of its special attachments, simply a two-jawed universal chuck mounted on a turntable and "ball," the whole thing being set into a ring. This article will deal principally with the regular style, which is shown in detail in Fig. 7.

By examining Figs. 1 and 7 it will be seen that besides the two chuck-jaws *D*, there are two removable false jaws *E*, upon the top of which are placed two semi-circular pieces of

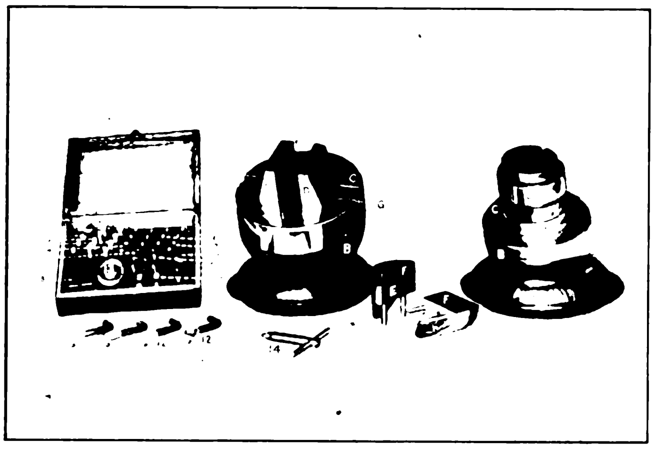

Fig. 1. Regular and Keyless Engraving Blocks and Attachments

Fig. 2. Partly finished Castings for the Spherical Base

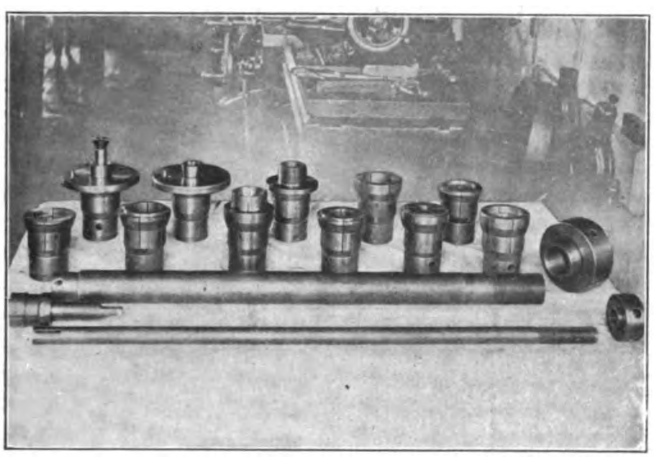

Fig. 3. Set of Split Chucks for Jones & Lamson Lathe

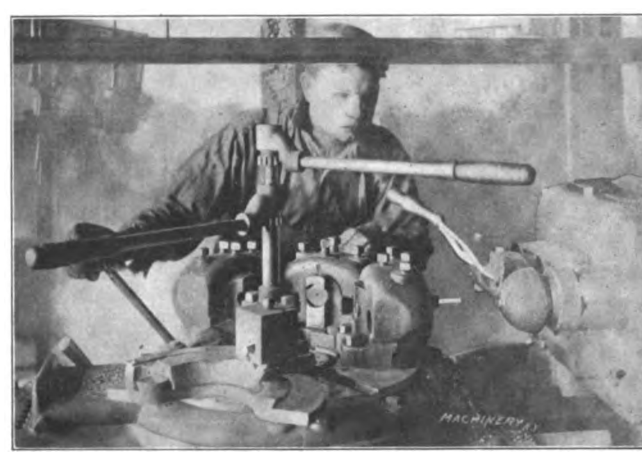

Fig. 4. Centering the Spherical Base

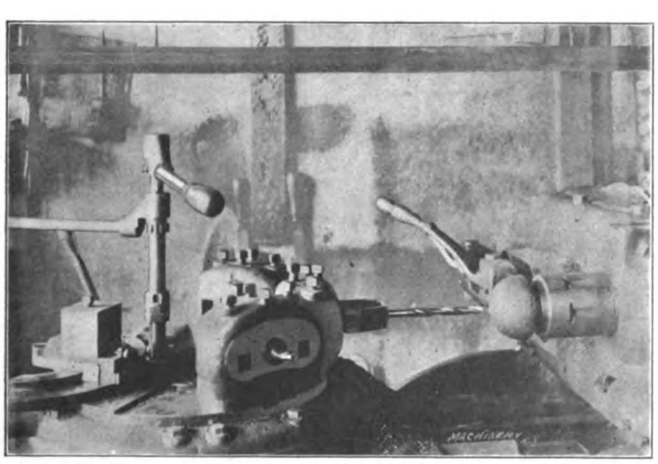

Fig. 5. Drilling the Hole in the Base

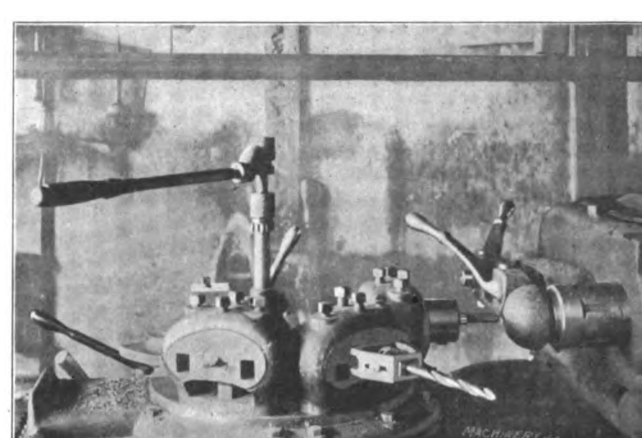

Fig. 6. Tapping the Hole in the Base

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steel *F*, one of which is stationary and the other swiveled. These top pieces have holes drilled about three-quarters of the way through them for the insertion of the various attachments shown in the box and on the table at the left in Fig. 1. The numbers given to the parts correspond to those of similar parts which are shown in the line engraving, Fig. 8, except that 13 and 14 are omitted in the latter, as they are simply a key with a knurled head for light work, and a key with a

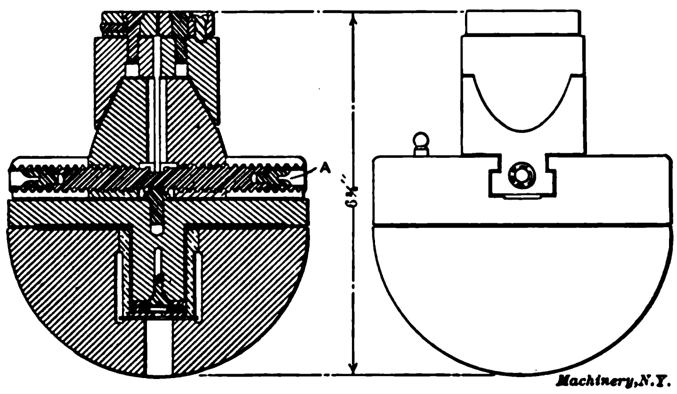

Fig. 7. Elevation and Section of the Engraving Block

cross handle for heavier duty. The way these attachments for the top pieces or third set of jaws, are used by the engraver for holding different shapes, is partially shown in Fig. 9. The method of holding a fancy pencil-case is shown at *A*; *B* shows the bowl of a spoon clamped to the block; *C* a spoon handle, and *D* a small locket or pendant. The large rubber-covered hooks shown at 12, Fig. 1, are intended to hold large metal plates, and they are usually used directly in the jaws *D*. The length of the two pins in the false-jaws *E* is such that the jaws will stand, as shown in the engraving. This is often a desirable feature when special attachments are used and the work is interrupted and must be removed for a few minutes on account of other and perhaps heavier work. The pillows *A* shown in the halftone are leather rings which are filled with sand. These rings are far more "clinging" and satisfactory than wood or metal ones.

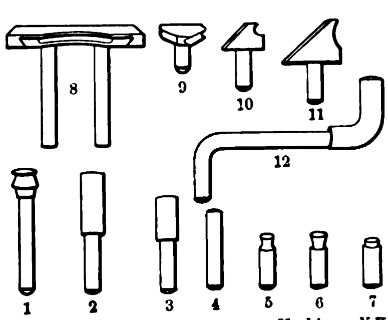

Fig. 8. Auxiliary Attachments for the Block

Making the Bases

The hemispherical, or "ball" bases *B*, are made of cast iron and are cored out to make them light and convenient to

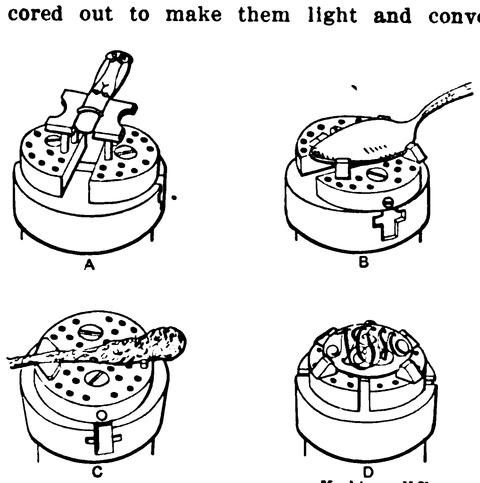

Fig. 9. The Way in which Irregularly Shaped Pieces are held by the Auxiliary Attachments

handle. In machining these bases they are first placed in an ordinary three-jawed chuck; the "flat" part is then turned and the hole bored as shown by the barrel of castings in Fig. 2. The bases are next held in a Jones & Lamson flat turret lathe, by means of the bored holes which fit over an expanding chuck.

Most men who have worked in the big watch factories have a strong liking for split chucks, and Mr. Muehlmatt is no exception, as will be evident by examining Fig. 3. This

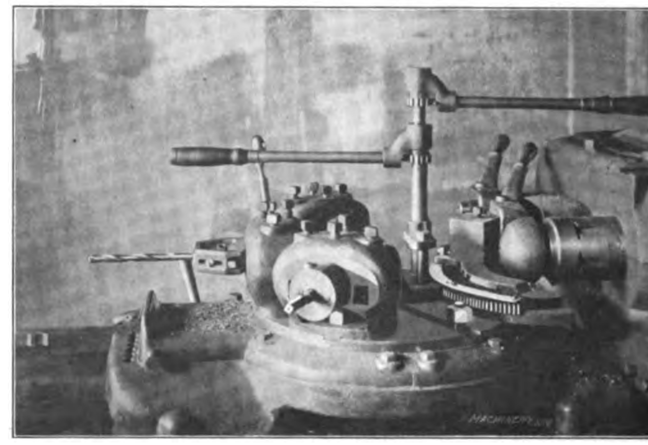
Fig. 10. Attachment for Turning the Spherical Surface of the Base

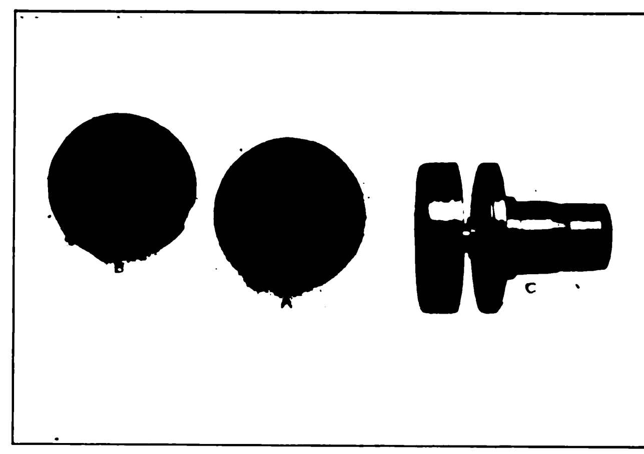

Fig. 11. Turntable of the Block with Jig and Chuck for Machining it

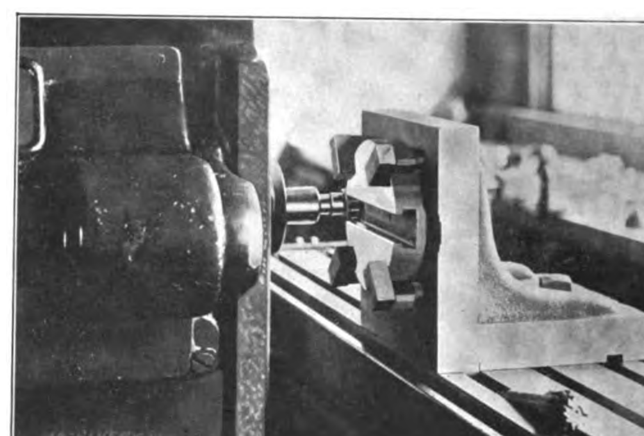
Fig. 12. Finishing the T-slot in the Turntable

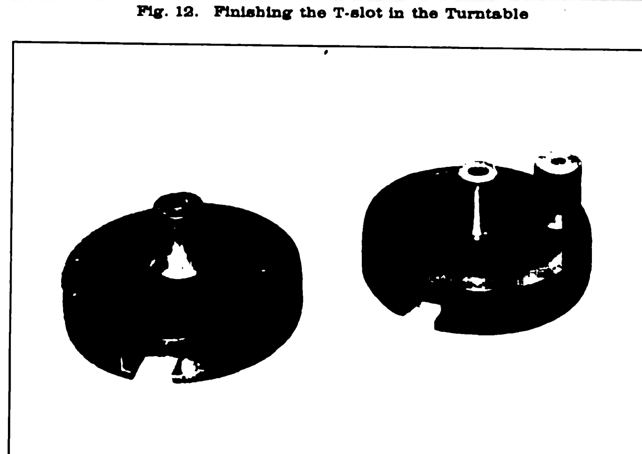
Fig. 13. Method of Protecting Turntable Bearings from Plating Solutions

complete set of spring chucks, both expanding and contracting, types, together with the quill and rod shown, were made for use on the Jones & Lamson lathe, to do this special work. It is seldom that work of this kind is done on a lathe of this type, so that it is worthy of more than passing notice.

Centering, Drilling and Tapping

After placing the base on the expanding chuck, the first operation is to center it for starting the drill, as shown in Fig. 4, using the usual form of flat centering tool. The hole is then drilled, and tapped as shown in Figs. 5 and 6.

right shaft having two ratchet hand-levers on the upper end. These ratchets are very convenient, as they not only allow the levers to be in any position while they are being used, but also allow them to be swung out of the way during the other operations.

After the bases are removed from the lathe they have a small hole drilled in the flat or top part for a stop-pin that locks the turntable and base together when the swiveling

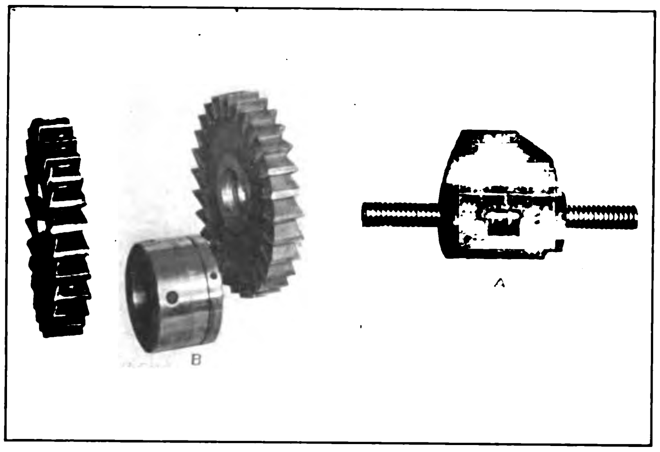

Fig. 14. Micrometer Spacing Collar—Jaws ready to be Machined

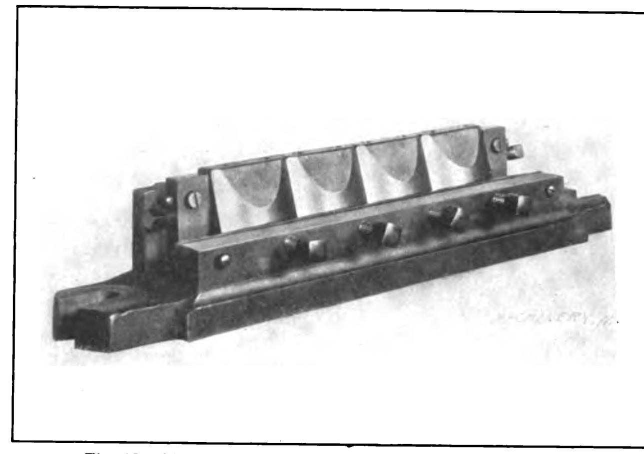

Fig. 15. Fixture for Holding Jaws while Milling the Bevel

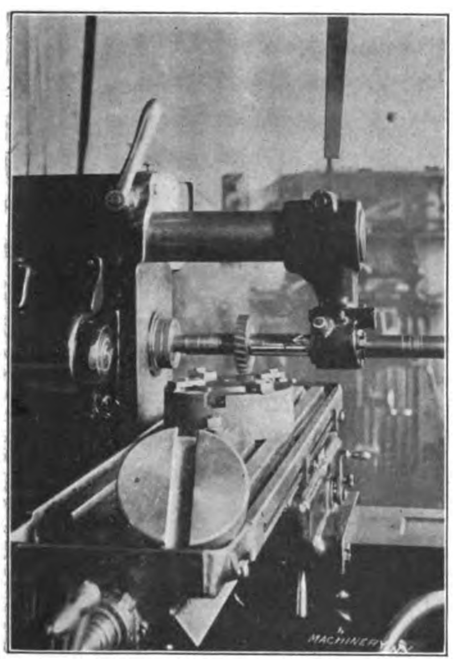

Fig. 16. Channelling out the Turntable for the T-slot

Fig. 17. Damaskeening the Turntable Top in a Drill Press

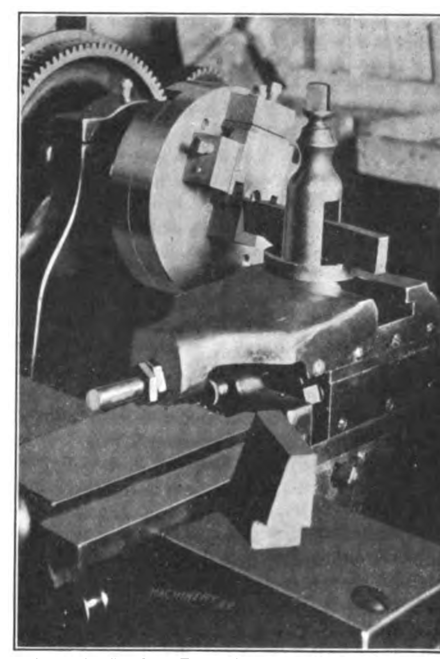

Fig. 18. Boring, Threading and Facing Jaws in a Lathe

Fig. 19. Turning the Outside of the Jaws in the Lathe

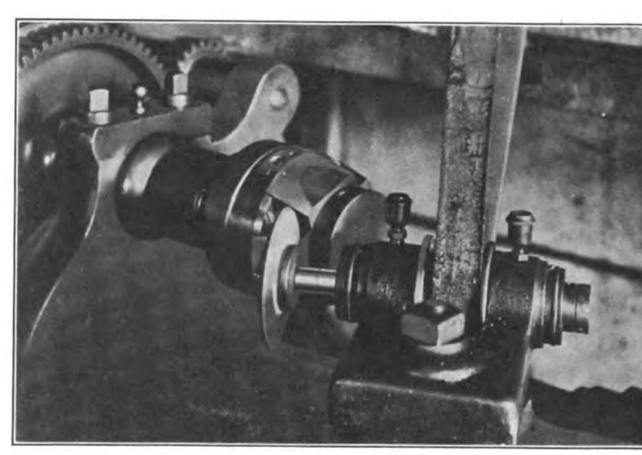

Fig. 20. Grinding the Outside of the Jaws

Turning the Hemisphere

The next operation consists of turning the spherical surface, using the device shown in Fig. 10, which was designed by Mr. Muehlmatt. As will be seen, the device consists mainly of a circular-shaped rack or gear-segment carrying a tool-post and tool, which is turned by means of a small pinion, meshing with the gear teeth. This pinion is fastened to an up-

motion is not desired. They are then ground and polished ready for the nickelplater.

Machining the Turntables

The turntables *C*, Fig. 1, a rough casting of which is shown at *A*, Fig. 11, are first held in a regular chuck, the bottom and stem turned and the small hole for the screw that holds the hardened washer drilled and tapped. The stop-pin hole is next drilled, using the jig shown at *B*, which slips over the turned stem. This jig is also used to drill the hole in the base just referred to, a collar on one side just fitting the large hole in the base. In this way the stop-pin holes in the two parts are sure to line up. Two small bushed holes are in the jig shown because it is used for two different sizes of engrav-

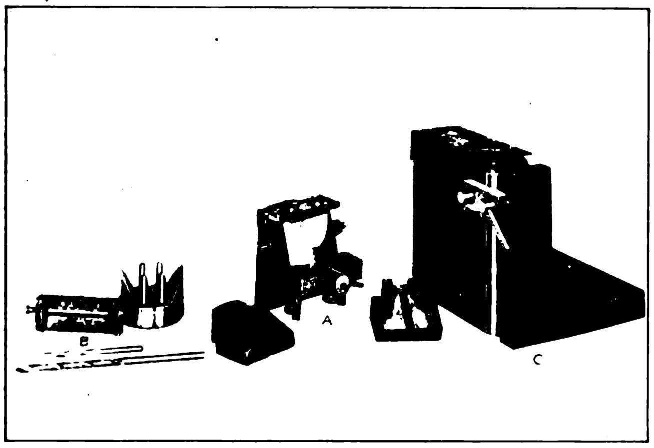

Fig. 21. Two Jigs and a Fixture used in the Construction of the Block

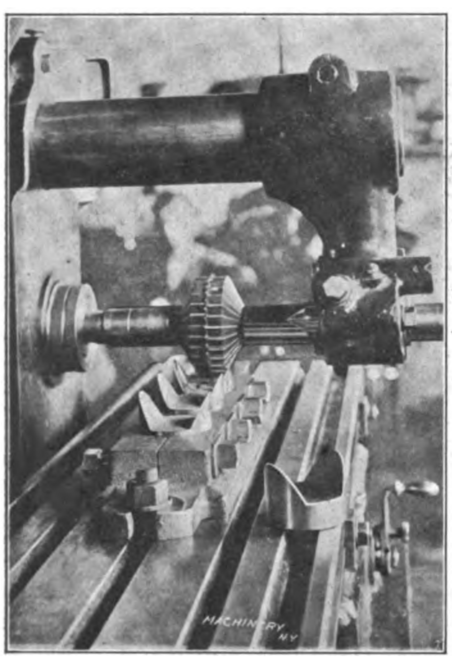

Fig. 23. Milling the False Jaw Blanks

ing blocks. The partly machined turntable is next held in the split chuck *C*, which fits the Jones and Lamson lathe, and the face and outside diameter is turned. The chuck *C* has a face-plate attached to it which has a pin in it fitting the stop-pin hole of the turntable; this pin acts as a driver.

Milling the T-slot for the Chuck Jaws

When the turntables go to the milling machine to have the T-slots for the chuck jaws cut in them, they are placed in the fixture shown in Fig. 16 and channelled out. They are then transferred to the angle-plate jig, Fig. 12, and the T-slot finished. The edges of the slot are next rounded with the milling cutter lying on the table; the parts are then ready for the final grinding and plating.

In plating, it is undesirable to have nickel or copper deposited on the stem as it is a bearing, so small metal caps, Fig. 13, are placed over the stems to keep off the solutions.

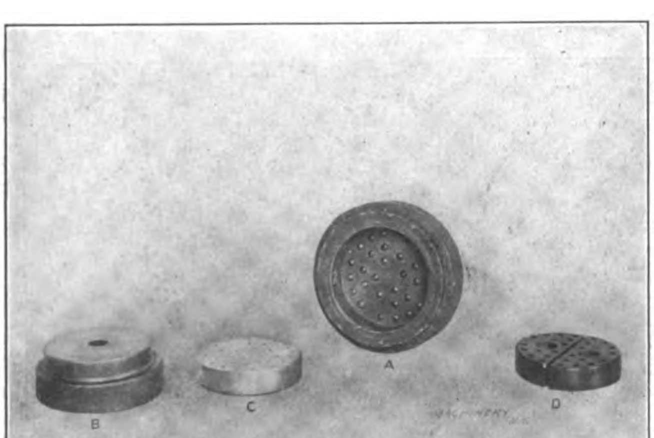

Fig. 25. Tools for Laying Out Holes in Jaws F, Fig. 1

Damaskeening the Turntables

The fancy spotting or damaskeening of the turntable tops is done on a small drill press (Fig. 17), the turntable being revolved on its own stem, which is set into a socket in the special base. The spotting tool used is simply a piece of steel rod, to the end of which is cemented a disk of leather. In

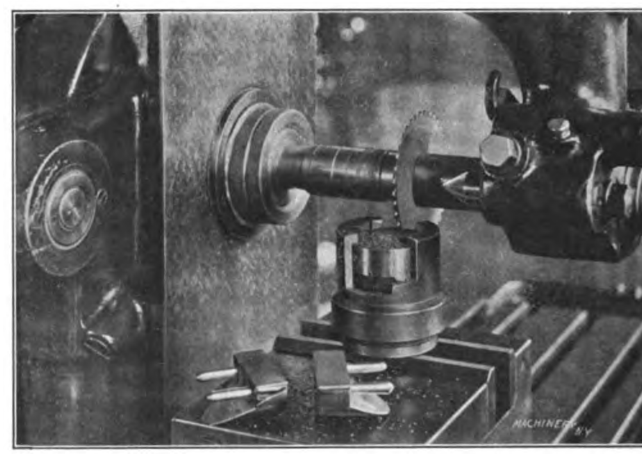

Fig. 22. Splitting the False Jaws in the Milling Machine

doing the work the top of the turntable is smeared with fine emery and oil and it is turned with the left hand while the right works the rapidly revolving tool up and down by means of the hand lever.

Machining the Jaws

Most of the ordinary straight milling on the chuck-jaws, such as facing off the top and sides, is done by holding the piece in the regular vise, but for truing the face of the jaw and boring and threading the clamping screw hole, they are held in the lathe by the fixture shown in Fig. 18. After a pair of jaws have been screwed together, as at *A*, Fig. 14, they are "squared" all over and stamped as mates. In the final fitting to the turntable the idea is kept in mind that while the fit must be good, the parts must work freely and easily with no bind anywhere.

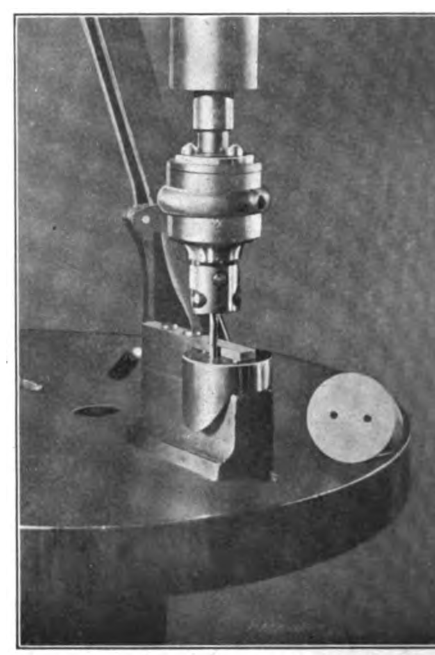

Fig. 24. Jig and Tapping Head for the False Jaws

A micrometer-adjustment spacing-collar is shown at *B* in Fig. 14, which is very convenient for straddle-mill work.

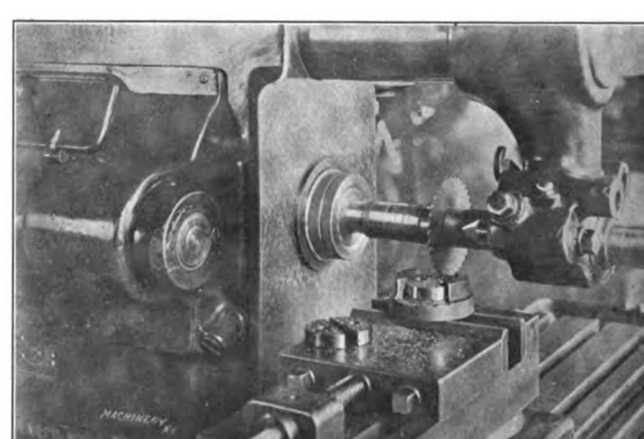

Fig. 26. Splitting the Jaws F, Fig. 1

In Fig. 15 is shown the fixture used for holding the jaws while milling the bevel on them, which is done with a bevel side-mill. Fig. 19 shows the way four of the jaws are held in the lathe while turning them, and Fig. 20 shows how the same fixture is used to hold them while they are being ground.

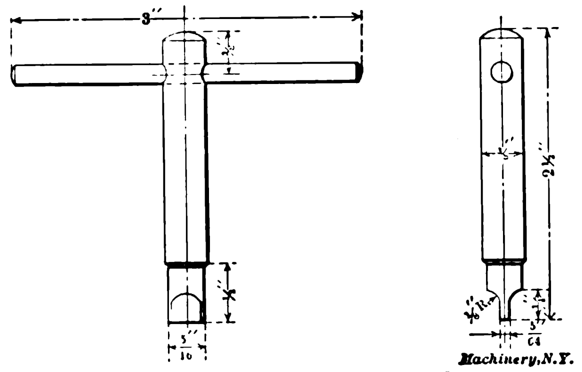

Fig. 27. Key used for Tightening the Jaws

When drilling the holes for the pins which hold the false-jaws in place, the chuck-jaws are placed in the jig shown at *A*, Fig. 21.

The False Jaws

The false jaws are both cast in one piece with a pin or stem on them similar to the one on the turntable, which is

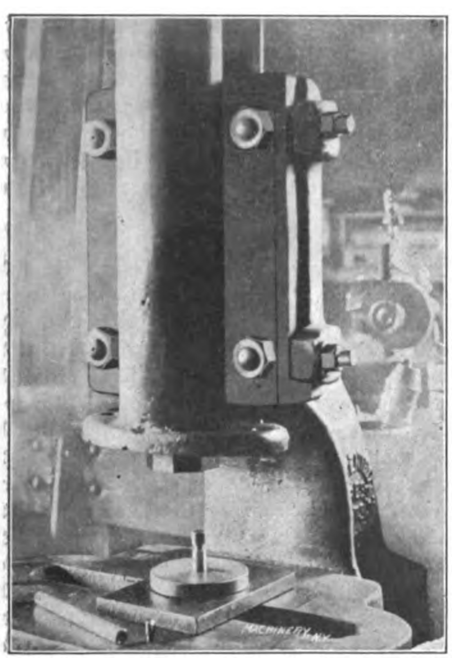

Fig. 28. Forcing the Piece A, Fig. 7, into Place

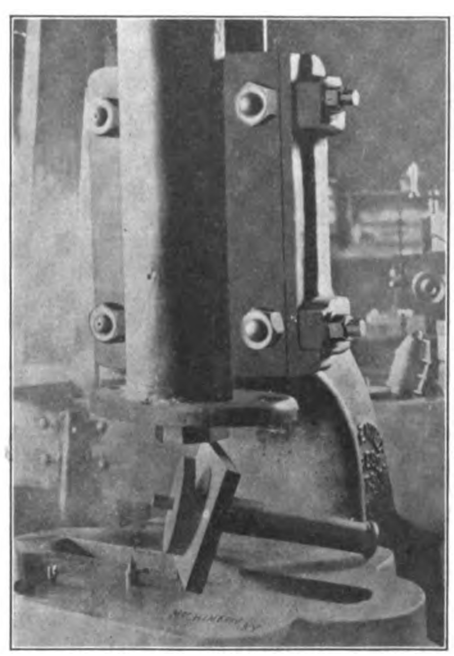

Fig. 29 View showing Holder and Shape of Punch

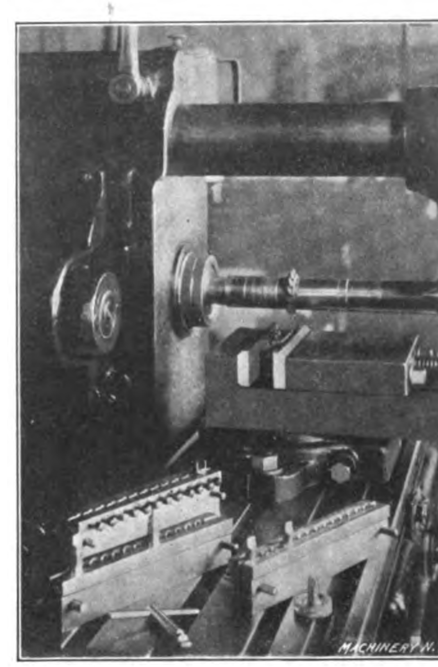

Fig. 30. Milling the Slots in the Pieces A, Fig. 7

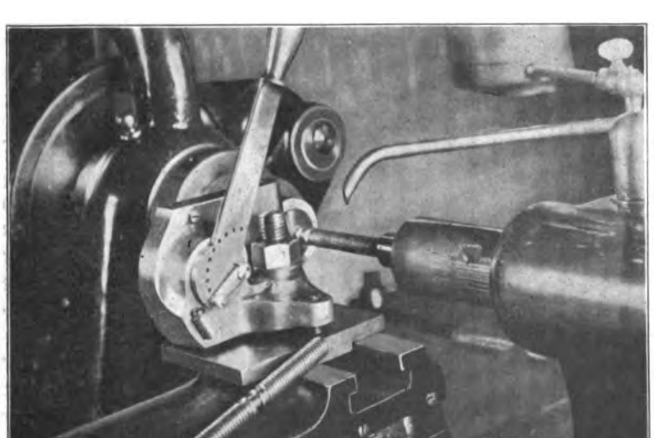

Fig. 31. Threading the Clamping Screws

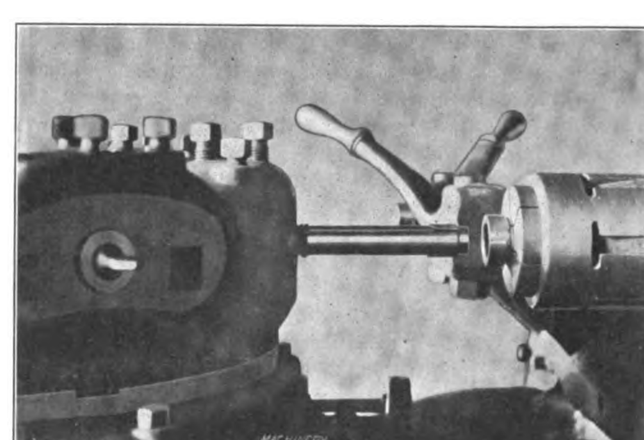

Fig. 32. Boring the Turntable Bushings

used to facilitate handling. The false-jaws are chucked by this stem, the outside turned and the stem is then cut off and the piece faced off at the same time. The blanks are next placed in the fixture, Fig. 23, and milled as shown. The slot which is sawed down the middle is put there to act as a guide for the drilling jig *B*, Fig. 21, used to drill the pin holes and the holes for the upper jaw screws, the jig having a tongue which exactly fits this slot.

The jig and geometric tapping head shown in Fig. 24 are used while tapping the screw holes in the false-jaws; the jaws are then placed in a fixture and split in the milling machine, as shown in Fig. 22.

The upper or swivel jaws, *F*, Fig. 1, are at first only flat pieces of steel, which are placed, one at a time, into the box-like piece *A*, Fig. 25. The part *B* is then placed on top and a blow given it under the hammer, with the result that all the holes to be drilled in the piece are "spotted" at one stroke by the blunt punches in the bottom; the piece then appears as shown at *C*, while at *d* its appearance is shown after all the holes have been drilled and the piece split. This splitting is done as shown in Fig. 26.

By referring back to Fig. 7 it will be seen that the screw that clamps the jaws together has a rather peculiar arrangement in the ends for the key. Instead of having a square hole, drifted out as usual, it has a piece, *A*, pressed into it.

The way the screw-blank is held while the ends are drilled for this piece is shown at *C*, Fig. 21. After the holes are drilled the small pieces are forced in with a hand-press as shown in Fig. 28, the holder and shape of the punch used being shown in Fig. 29. The style and shape of the end of the key used is shown in Fig. 27. The way these small key-pieces are held while being slotted is shown in Fig. 30. Three other gang jigs are also shown on the table in this halftone. The forcing in of the slotted key-pieces necessarily swells the ends of the screw-blanks to some extent, but as the thread is cut afterward no harm is done. This thread is cut with a Rivett-Dock threading tool. One-half the screw is held in a split chuck with the outer end steadied by the tail-stock center, as shown in Fig. 31, the blank having, of course, been previously turned to size.

Bronze bushings are set into the base of the engraving-blocks, as a bearing for the stem of the turntable. In machining the inside of these bushings they are held in a draw-in chuck in the Jones and Lamson turret lathe, rough bored, and then finished to size with a Schellenbach-Hunt adjustable boring-bar, as shown in Fig. 32. The use of a boring-bar

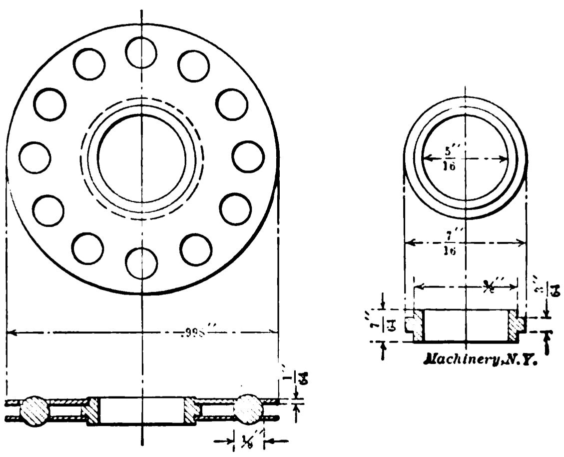

Fig. 33. Detail of the Ball Bearing for the Turntable

seems to be the best way to secure accurately bored bushings in this case, as any attempt to finish bore with a tool depending on a carriage stop will not give uniform results.

At the bottom of this bronze bushing as it rests in place in the base, is a special form of ball bearing which is shown in detail in Fig. 33. The cage consists of two punched disks held together by a hub onto which they are pressed and riveted fast. The manner in which this cage works between two hardened steel disks may be seen by referring to Fig. 7.

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Reinforced concrete is rapidly coming into use as a building material and for making engineering structures of all kinds. It is a material admirably adapted for permanent structures, being practicably indestructible and gaining strength with age. It is not a material easy to handle, however, and special apparatus and experience are required to make a concrete structure secure. Some who are of the idealistic type, are dreaming of an ideal building material which can be molded into form without the difficulties and drawbacks of concrete, and one of the great developments of the future may be a partial realization of these dreams. It is possible that water will be the principal part of the new building material. Suppose that the normal temperature were at or below zero. Water would then make an ideal building material, provided, of course, that it could be readily obtained and that the interior temperature of the building would never rise above the melting point. Ice blocks would then be as good as concrete blocks, and finely divided ice could be used for the bond or mortar at the joints; or water-tight forms could be used to give the desired shape, the water being poured in, and allowed to freeze. Ice structures have been built in northern countries, and used for a variety of purposes, including exposition buildings of large size. The dreamers of an ideal building material have thought of the possibility of discovering a material which added in small proportions to water would cause it to crystallize and take permanent form having strength and heat-resisting qualities equal to cement. When we consider how little solid matter is required to make a firm jelly, it does not seem inherently impossible that the dream may be realized. Granting realization, then, monolithic construction would be reduced to the simplest terms, and the cost of transportation of the greater bulk of the material in cities would be eliminated, save that the charge for water is partly due to the cost of piping to the spot.

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A great many women students are, at the present time, studying at the German engineering schools. According to a consular report, 1,230 female students are enrolled at the nine leading German engineering schools.

PATENT LAWS AND THE COST OF MANUFACTURE

In the new British patent act a clause is inserted requiring that articles patented in Great Britain shall be manufactured in that country to "an adequate extent." The United States Consul J. M. McCunn of Glasgow, states that he has been informed that under this law parts of patented machines and devices could be manufactured in the United States and then simply assembled in Great Britain. The ground on which this view is taken is that each part of a machine considered separately is not a patented article, and that the patent merely applies to the machine as a whole. As no test case has been brought into the courts, the Consul states that the previous opinion is the generally accepted reading of the law until a test case has been brought. Should this be a sound opinion it would mean that the new British patent act would be valueless in bringing about the results for which it was framed, and the construction of the law along the lines indicated would be entirely out of harmony with ordinary common sense. From an engineer's point of view assembling in itself cannot be considered manufacturing. A manufacturer of patented articles would at least be expected to make the majority of the integral parts. It is admitted, of course, that it is difficult to draw a distinct line between actual manufacturing and assembling. Many automobile firms, for instance, buy a large proportion of the parts ready-made from manufacturers of specialties in that line, yet, these manufacturers are generally and properly considered makers of automobiles. When assembling pure and simple is referred to, however, it is clear that no engineer would refer to the process as manufacturing, and the British lawyers who would interpret the new law to that effect are likely to find it rather difficult to convince an intelligent court, and even more difficult to secure expert testimony to support their view of this matter.

Taking larger views of the question, however, and considering from the productive engineer's point of view the benefit derived fom a law requiring patented articles to be manufactured in every country where the patent is granted for the article, there is considerable chance for difference of opinion with the framers of the new British patent act. While it is reasonable to require that every inventor or firm owning an invention should make use of it if a monopoly in the manufacture of the article in question is expected, it is not so clear that it is reasonable to require that every patented article should be manufactured in every country where the patent is in force. Such a requirement is simply an indication of the narrow sphere of thought from which mankind is slowly emerging, and is distinctly uneconomical from the productive engineer's point of view. It requires a duplication of plant and special machinery at great expense; in the end no actual benefit is derived by anybody, and the productive capacity of a great number of people is merely turned into wrong and useless channels. The engineer is concerned primarily with the reduction of the cost of production, and to him the question of prime importance should be to what extent any special law reduces this cost. From the engineer's point of view it would evidently be best that the whole world's supply of a certain article be manufactured in one or a few places where the cost of production of that certain article is the lowest. Of course, the economic gain from centralized manufacture would be lost in cases of exceptionally bulky or heavy manufactures, where increased freight charges would become a serious item. In this connection tariff duties between different countries ought to be considered, but as these are artificial and not natural barriers, the engineer may disregard them for the moment when he endeavors to arrive at a law governing the most economical methods of production. In the final analysis, of course, the results of tariffs between different countries must also be considered, as they increase the cost of production of the world's total supply of any one article, and consequently work in opposition to the constant aim of the engineer of decreasing the cost of production and devising means for producing the largest amount of goods at the smallest expenditure of labor.