Feb. 11, 1947. H. G. BRABAZON 2,415,575

METAL CUTTING AND POLISHING APPARATUS

Filed June 21, 1945

FIG. 1.

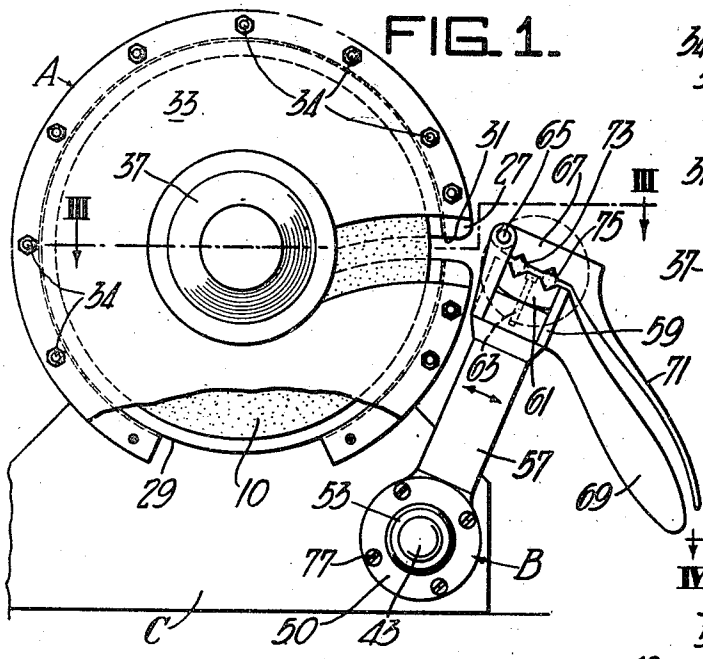


FIG. 2.

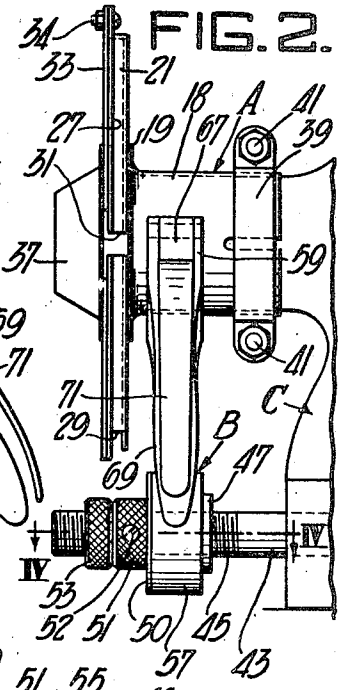


FIG. 4.

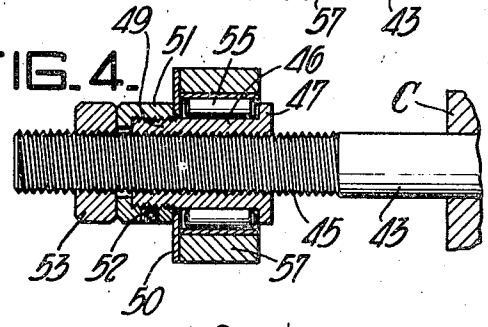


FIG. 3.

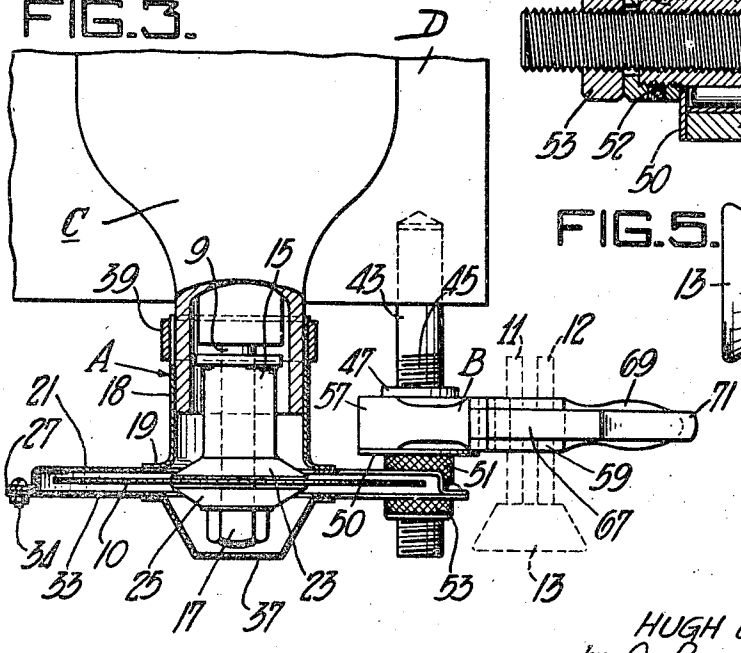


FIG. 5.

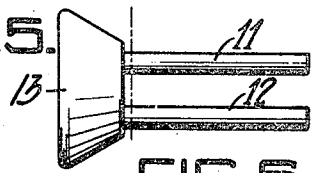
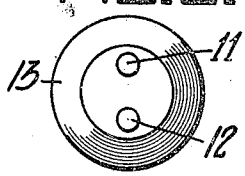


FIG. 6.



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METAL CUTTING AND POLISHING APPARATUS

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Application June 21, 1945, Serial No. 600,757

6 Claims. (Cl. 51—98)

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In modern metallurgical operations where given specifications must be closely adhered to, spectrum analysis plays an increasingly important part. A metal, when it is vaporized and suitably excited in a flame, an arc or a high tension spark, can be made to give out light. This light which is definitely characteristic of the metal used is sorted out through the spectrograph and recorded on a photographic plate or film. Through spectrograph analysis it is possible to determine the composition of the steel, as to the elements it contains, and thus obtain the physical properties of the steel. This method is a simple, certain, and speedy way to detect the whole of the metallic constituents of any metal or alloy as well as those of mineralogical preparations.

The test specimens used in spectroscopic analysis are cast in a mold where two specimens, with a common sink head, are formed. The two specimens are then cut from the sink head and the cut-off ends prepared for the high voltage spark unit. It is of utmost importance that the test specimens are properly prepared and that the ends between which the arc is formed are square, polished, and free from foreign substances that would impair the accuracy of the analysis. The test specimens, approximately ¼ inch diameter by 2 inches long, are placed directly in conductive electrodes and vaporized into the arc by the high temperatures obtained.

Prior to cutting off the specimens on an emery wheel the specimens were separated from the sink head by inserting the two pins of the casting in holes drilled in a scrap rail section about two feet long. The sink head was then removed with successive blows of a hammer. This method was not satisfactory as the specimens became bent, making it difficult to square the ends for the high voltage spark unit. Because of this difficulty, this practice has been superseded by the procedure whereby the cutting and polishing of the specimens is performed manually on a thin emery disc, which is a slow and dangerous procedure, as the emery disc breaks readily.

The present invention has for its object the provision of a safe device to prepare test specimens for spectrum analysis and to provide a machine which will cut and grind the test specimens at the same rate that the spectrograph can produce the photographs.

A further object of the present invention is to provide a positive means of cutting off the test specimens from the sink head while providing

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means for assuring square cut ends of the test specimens.

A still further object of the invention is to minimize breaking of the thin cut-off emery wheel, and to provide means for producing uniform specimens, while eliminating danger to the operator from flying metal chips and fragments of the emery wheel in the event that the wheel does break.

Further objects of the invention will become apparent from the following description, and the features of novelty will be pointed out in particularity in the appended claims.

The invention will be understood with reference to the accompanying drawing, wherein:

Figure 1 is an end elevation of a specimen-preparing mechanism including the improvements of the present invention;

Figure 2 is a fragmentary side elevation of the mechanism of Figure 1;

Figure 3 is a sectional plan view on the line III—III of Figure 1;

Figure 4 is a detailed sectional elevation taken on the line IV—IV of Figure 2;

Figure 5 is a side elevation of the specimen being prepared; and

Figure 6 is an end elevation looking to the left of Figure 5.

Referring more particularly to the drawing, reference character A represents generally a housing assembly in which is mounted a shaft or spindle 9. This spindle 9 carries a cutting wheel 10, adapted to separate the test specimens 11, 12, which are cast with a common sink head 13, the cutting wheel 10 being adapted to polish the severed ends of the specimens. The cutting wheel 10 is, in practice, preferably a thin emery disc, although other materials may be substituted for the emery.

The wheel 10 is mounted in a spacing member 15, that is held by a nut 17, threaded on the end of spindle 9.

The housing A is composed of a sleeve portion 18, which has a flange 19, welded to a plate 21. This plate 21 has a hole through the center sufficiently large to clear an enlarged hub portion 23 of the spacer 15. The hub portion 23 reinforces the cutting wheel 10 on one side, the opposite side of the cutting wheel 10 being supported by a washer 25, similar in shape to the hub portion 23, and retained in tight engagement with the cutting wheel 10 by the nut 17, which is threaded in the end of spindle 9.

Plate 21 has an offset peripheral flange 27, which extends around the plate except for inter-

ruptions at bottom opening 29, provided for the exit of steel particles and dust from the cut-off wheel, and at slot 31, which is provided for admission of the specimen to the cutting wheel. The flange 27 engages a closing plate 33, which also has a center hole sufficiently large to clear the washer 25. Plates 21 and 33 are secured together by bolts 34, and the central hole in the plate 33 is covered by an offset cap 37, which is welded to the plate 33. Therefore it will be seen that the cut-off wheel 10 is completely enclosed and guarded by the housing assembly. The sleeve portion 18 of the housing assembly is reinforced by a circular clamp 39, held by bolts 41. The spindle 9 is driven suitably by a motor, not shown, in motor housing C.

The test specimens are mounted for separation and end polishing in a holder assembly B.

This holder assembly includes a threaded adjusting bar 43, this bar being mounted in a base D for the apparatus, the bar 43 being positioned below the housing A and offset therefrom. The bar 43 is threaded, as indicated at 45, along the major portion of its exposed length.

Mounted on the threaded portion 45 of the bar 43 is a bushing nut 46 having an enlarged head portion 47 and a bushing portion 49, which is threaded on the inside for lateral movement along the threaded adjusting bar 43. The bushing portion 49 also is externally threaded adjacent to its end for receiving a knurled adjusting nut 51. This knurled adjusting nut 51 encloses the outer end of the bushing nut 46, clearing the threads 45 of the bar 43, thereby forming the operating means for effecting a fine adjustment of the position of the nut 46 on the bar 43. A lock screw 52 is provided for locking the nut 51 on the threads of the bushing 49 to maintain a running fit for the roller bearing to be described hereinafter, and to enable the nut 51 and the bushing nut 46 to be moved as a unit, rotation of the nut 51 causing rotation of the bushing nut 46 with attendant movement thereof along the threaded portion 45 of the adjusting bar 43 into desired adjusted position, in which the nuts 51 and 46 are locked by a knurled lock nut 53. Manipulation of nut 51 effects a fine adjustment of the nut 46 along the threads, rapid adjustment of the nut 46 being effective by turning on head 47 with a wrench.

The head 47 of nut 46 serves as one side of a bearing race, the other side of the said race being defined by cover plate 50, which is retained by the end of the adjusting nut 51. Engagement of the head 47 with the unthreaded portion of the bar 43 serves as an inner stop for movement of the holder assembly.

The above-mentioned bearing race receives roller bearings 55, on which is mounted rotatably a bracket arm 57. The bracket arm 57 has an enlarged head 59, which is recessed and bifurcated. In the head 59 there is mounted a floating jaw 61, rounded at the bottom in a radius and held in place by a screw 63, which is threaded into the bottom of head 59 of bracket arm 57. Sufficient clearance is provided between the floating jaw 61 and the screw 63 to enable the jaw 61 to rock on its curved bottom under clamping pressures sufficiently to equalize clamping pressures on the pins 11, 12 of the specimen to be tested.

Cooperating with the floating jaw 61, and pivotally mounted as shown at 65 is a complementary clamping jaw 67. Both the floating jaw 61 and the pivoted clamping jaw 67 are provided

with complementary recesses which are provided to receive the pins 11, 12 of the specimen being treated. The head 59 of the bracket arm 57 has a handle member 69, and the pivoted clamping jaw 67 is provided with a handle member 71, the handle members 69 and 71 being so positioned and proportioned as to be readily grasped manually by an operator for squeezing together the jaws 61 and 67, the resulting leverage being adequate to cause the manual pressure on the handle members to clamp tightly the specimen pins 11, 12 between the jaws.

When the jaws are closed, the complementary recesses therein form apertures 73, 75 for receiving and clamping the specimen pins, in such manner that, with proper adjustment of the nut 46 and bracket arm 57, manual rotation of the bracket arm 57 toward the cutting wheel 10 presents the specimen pins 11 and 12 into the slot 31 and through the slot into engagement with the cutting wheel, whereby the sink head 13 is severed along the dotted line of Figure 5 and the resulting ends of the specimen pins 11 and 12 are squared off.

In order to permit free entry of the specimen into the slot 31 and application of the specimen to the cutting wheel, the slot 31 extends from the rim of the housing to the cutting disc or wheel 10, and is formed as an arc on a radius concentric with the center of the adjustment bar 43, the adjusting nuts 46 and 51 enabling the bracket arm to be maintained always positioned properly relative to the slot 31 to permit the specimen pins 11 and 12 to be presented properly to the cutting wheel 10 for evenly cutting off the sink head 13, and polishing the resulting square-cut ends of the specimen pins 11 and 12, as the sink head is cut off.

Metal chips and dust are discharged from the interior of the housing A through the opening 29 at the bottom of the housing. Screws 77 hold the cover plate 50 in position, as shown.

While a specific embodiment of the present invention has been described herein and illustrated in the accompanying drawing, it will be understood that the invention is not limited to this specifically illustrated and described embodiment, as it will be apparent that the device of the invention is of general application in the grinding art where operators are normally subjected to hazard from flying chips and particles.

I claim:

1. Cutting apparatus comprising, in combination, a cutting tool, a housing enclosing the cutting tool, a bar rigidly mounted adjacent to the housing, a bracket arm adjustably mounted on the bar and rotatable relatively to the bar, clamping instrumentalities on the bracket arm adapted to receive and to clamp an article to be worked upon by the cutting tool, the said clamping instrumentalities including a floating jaw having an arcuate bottom for receiving an article to be worked upon by the cutting tool and a recessed complementary movable clamping jaw pivotally mounted on the bracket arm and adapted to engage the floating jaw and article, a guide slot in the housing extending from the rim of the housing to the cutting tool, and instrumentalities for adjusting the bracket arm along the said bar for adjusting the position of the article clamped in the clamping instrumentalities relative to the said slot for enabling application of the article to the cutting tool, the arcuate bottom of the floating jaw enabling application of uniform

clamping pressure on the article clamped in the clamping instrumentalities.

2. Cutting apparatus comprising, in combination, a cutting tool, a housing completely enclosing the cutting tool, a bracket arm rotatably mounted adjacent to the housing, clamping instrumentalities on the bracket arm adapted to receive and to clamp an article to be worked upon by the cutting tool, the said clamping instrumentalities comprising a floating jaw mounted in the bracket arm, a complementary clamping jaw pivotally mounted on the bracket arm, complementary recesses in the said jaws for receiving the article to be worked upon, and a slot in the housing extending from the rim thereof to the cutting tool for enabling application of the article to the cutting tool, the said slot being on a radius concentric with the center of rotation of the bracket arm.

3. Apparatus for grinding and polishing metal specimens preparatory to spectrographic examination thereof, which comprises, in combination, a power-driven grinding disc, a housing completely enclosing the disc, a bracket arm rotatably mounted adjacent to the housing, mounting means for the bracket arm positioned below the housing and offset therefrom, clamping instrumentalities for receiving metal specimens to be worked upon by the grinding disc, the said instrumentalities including a floating clamping jaw mounted on the bracket arm, a movable clamping jaw pivotally mounted on the bracket arm, and handles for the jaws defining levers adapted to be grasped manually for application of clamping pressure to the specimens, a plurality of complementary recesses in the said jaws for receiving the specimens, the said floating jaw having its bottom formed on a radius enabling the floating jaw to rock under clamping pressure applied to the specimens received in the jaws for automatically equalizing clamping pressure on the specimens, an arcuate slot in the housing extending from the rim of the housing to the grinding disc, the said slot being on a radius concentric with the center of rotation of the bracket arm, and instrumentalities for adjusting the bracket arm along the mounting means therefor for positioning the bracket arm and specimens relative to the arcuate slot for enabling application of the specimens to the grinding disc responsively to rotation of the bracket arm, thereby enabling equal grinding and polishing of the specimens, the housing being provided with an opening in its bottom for enabling egress of metal chips and particles of grinding material from the grinding disc.

4. Cutting apparatus comprising, in combination, a housing, a cutting tool in the housing, an adjusting bar rigidly mounted below the housing and offset therefrom, the said adjusting bar being threaded along a portion of its length, a bushing nut threadedly mounted on the threaded portion of the adjusting bar for movement therealong, a bracket arm turnably mounted on the bushing nut, the said bushing nut being also externally threaded on its end, specimen receiving and clamping instrumentalities on the bracket arm, an adjusting nut threadedly mounted on the bushing nut, means effecting unitary operation of the bushing nut and adjusting nut, a slot in the housing enabling access of the specimens clamped in the said clamping instrumentalities, operation of the adjusting nut causing movement of the bushing nut and bracket arm mounted thereon for predeterminately adjusting the bracket arm and specimen relative to the said slot in the housing to enable predetermined application of the specimen to the cutting tool and means for locking the bushing nut and adjusting nut in adjusted position.

5. Cutting apparatus comprising, in combination, a narrow power-driven abrasive disc presenting a front grinding and polishing surface adapted to separate a metal specimen from a sinkhead, a bracket arm rotatably mounted adjacent to the abrasive disc, mounting means for the bracket arm positioned below the housing and offset therefrom, clamping instrumentalities mounted on the bracket arm for receiving the metal specimen, the said clamping instrumentalities having jaw members adapted to receive the specimen and to restrain the specimen against all movement in the clamping jaws while clamped, means for rotating the bracket arm and clamping jaws for radially presenting the specimen against the forward grinding edge of the narrow disc at right angles thereto for squarely severing the metal specimen from the sinkhead while avoiding any lateral movement of the specimen during the severing operation relative to the narrow abrading disc, and means for effecting a micrometric adjustment of the specimen laterally of the abrading disc subsequently to the severing operation for adjusting the specimen relative to the narrow abrading disc for enabling removal of any residual high spots from the squarely severed end of the specimen responsively to radial movement of the clamping jaws against a side surface of the grinding disc while avoiding substantial lateral pressure against the thin abrading disc.

6. Cutting apparatus comprising, in combination, a thin power-driven abrasive disc having a narrow abrading edge surface adapted to separate a metal specimen from a sinkhead, holding means for the specimen adapted to secure the specimen at right angles to the abrading edge of the disc, and to swing the specimen in a plane parallel to the disc but at right angles to the abrading edge surface of the disc, means for securing the specimen against all movement during the separation of the specimen from the sinkhead, means for micrometrically adjusting the now separated specimen laterally relative to the abrading edge surface of the disc, and means for arcuately swinging the resulting separated end of the specimen against a side surface of the disc while avoiding lateral movement of the specimen, thereby polishing the said separated end against the side surface of the disc while avoiding any substantial lateral pressure against the disc.

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