

May 14, 1940.

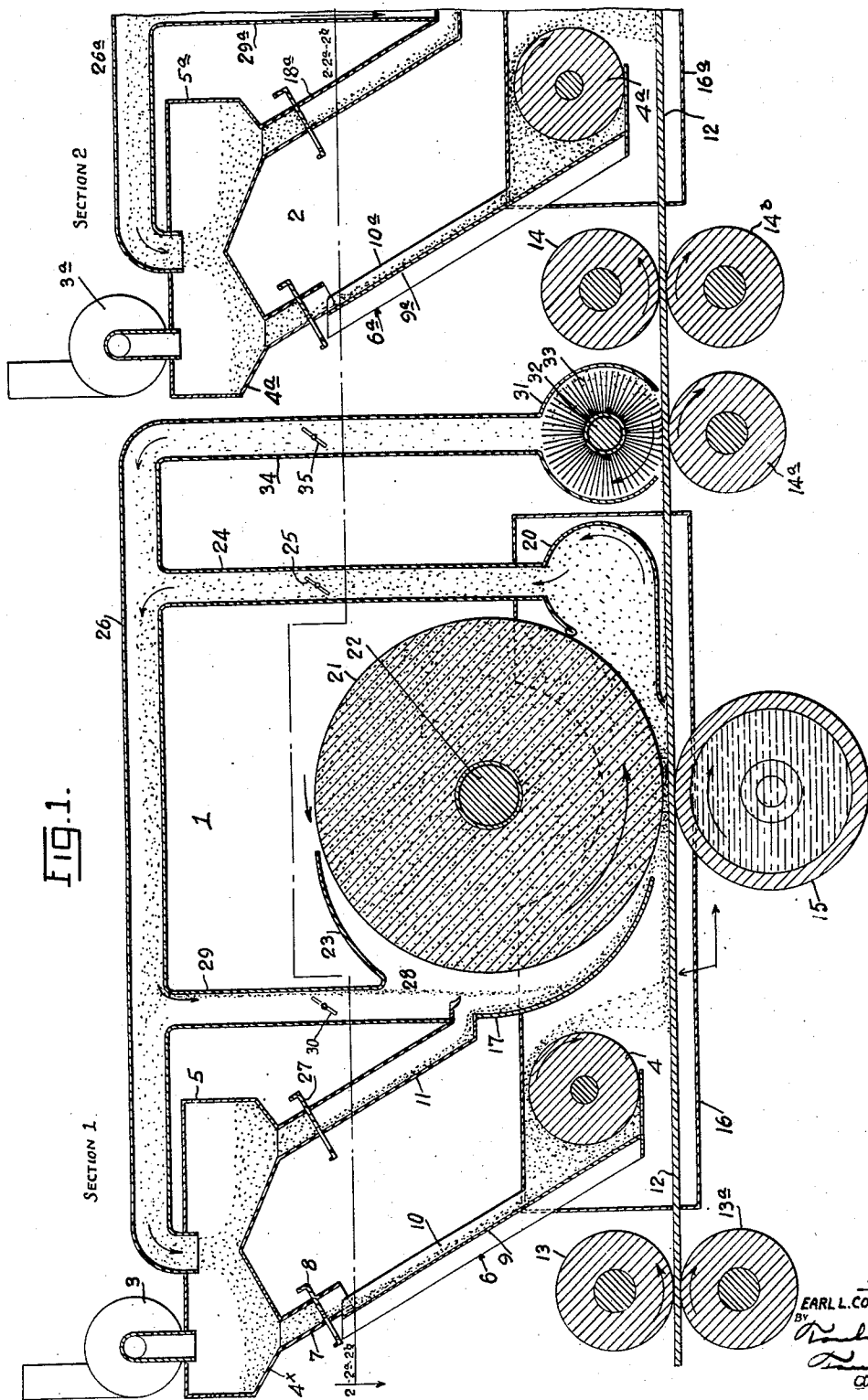
E. L. CODDINGTON

2,200,592

POLISHING APPARATUS

Filed Dec. 10, 1937

4 Sheets-Sheet 1



May 14, 1940.

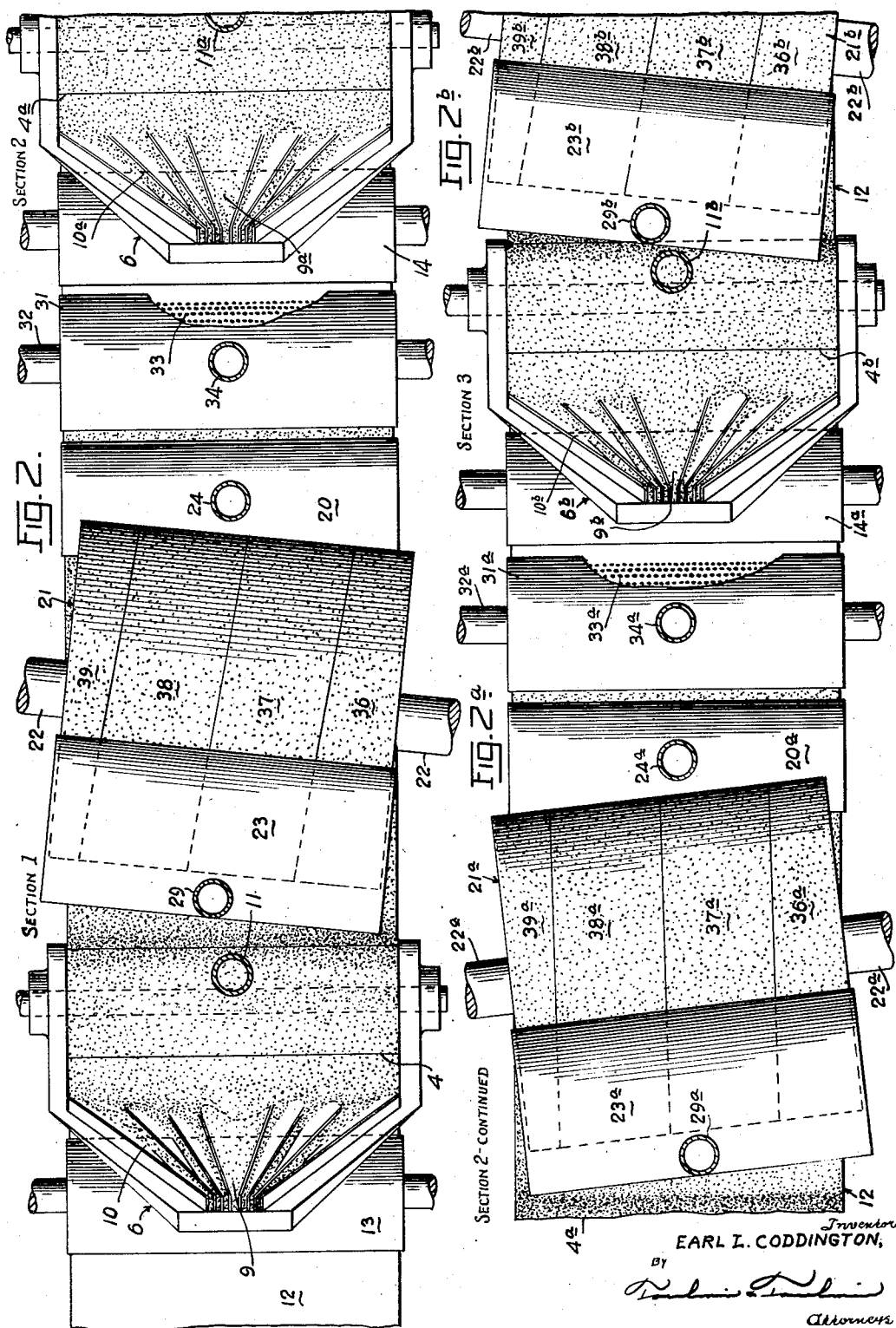
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4 Sheets-Sheet 3

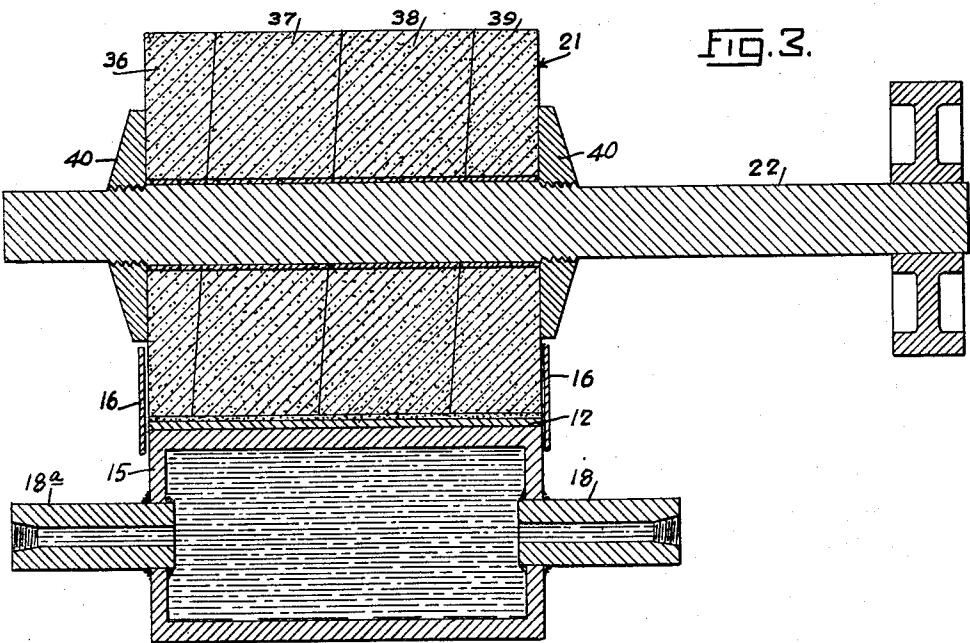


FIG. 5.

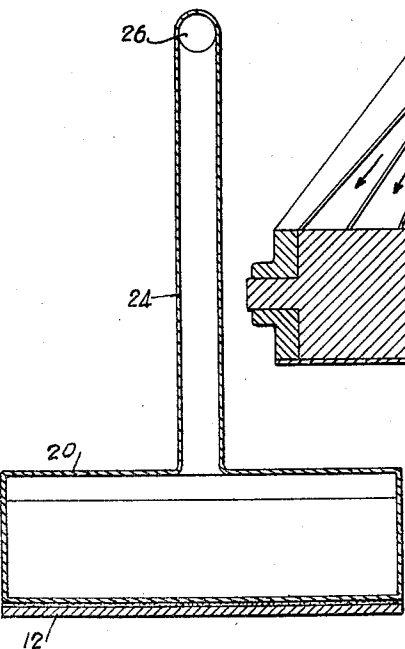


FIG. 4.

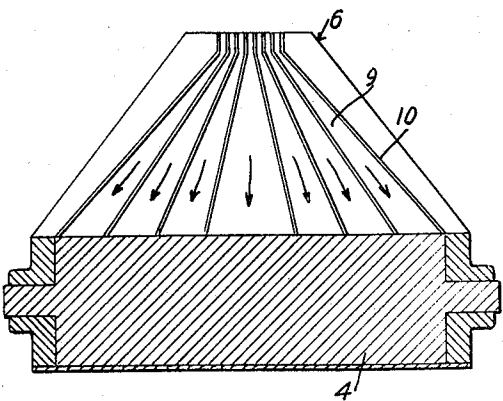
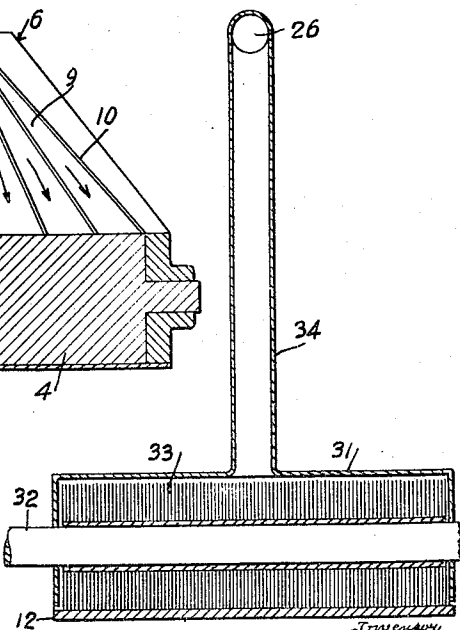


FIG. 6.



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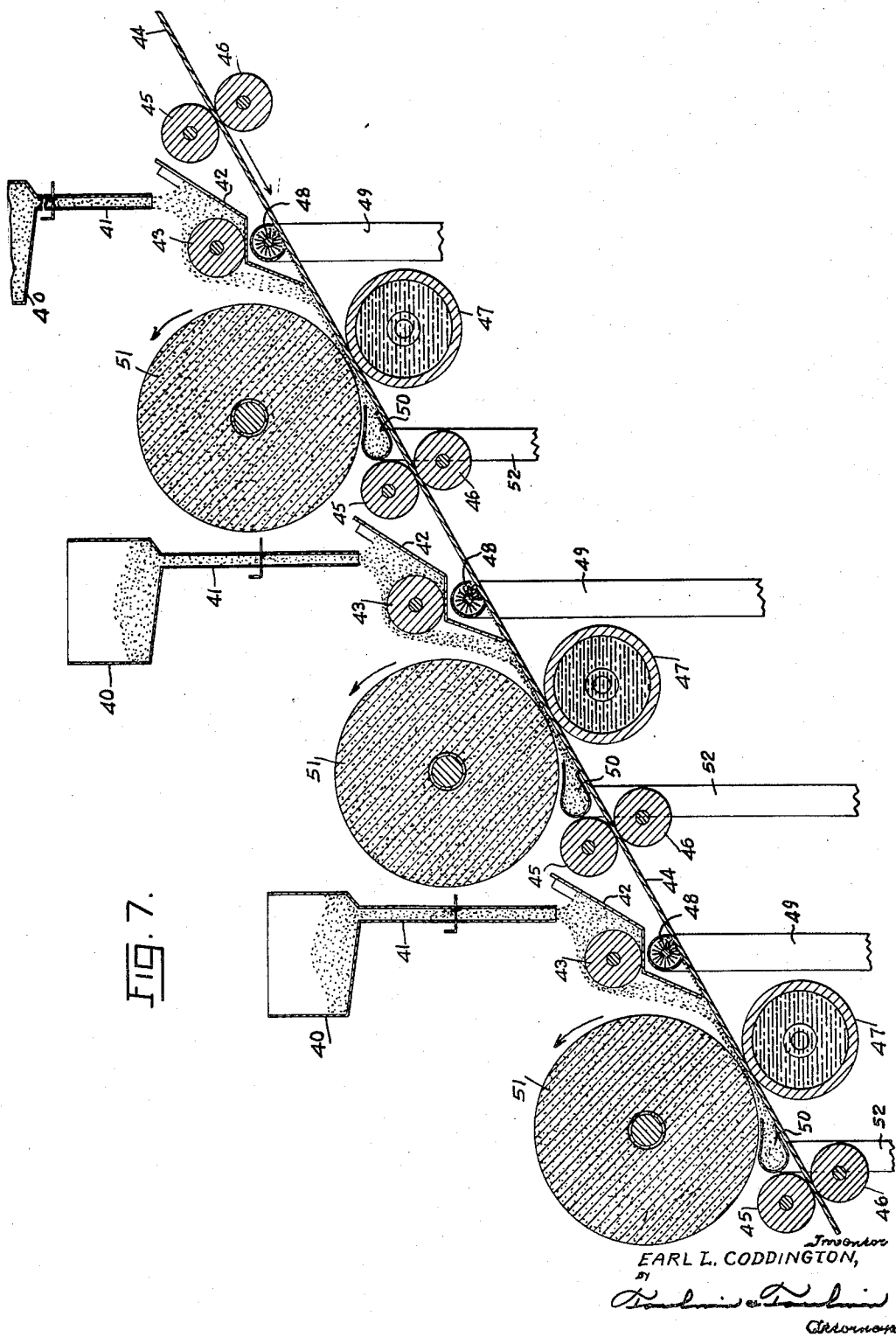
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POLISHING APPARATUS

Filed Dec. 10, 1937

4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,200,592

POLISHING APPARATUS

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Application December 10, 1937, Serial No. 179,164

3 Claims. (Cl. 51-78)

This invention relates to a polishing apparatus, adapted particularly to polish sheets of steel, iron, brass, silver, or any other metallic or partially metallic article, or even glass or stone, natural or manufactured, and wood, which it may be desired to treat (a) to cleanse and smooth the article, and (b) then to polish by further action of the machine.

In the accompanying drawings:

Figure 1 is a longitudinal vertical section of one unit of my polishing machine designated section 1 and of a portion of another similar unit connected therewith designated section 2.

Figure 2 is a plan view of the entire section 1 of my machine embracing the supply chute for the abrasive material, the abrasive feeding roll and the feeding rolls for advancing or moving the article to be polished; and also a plan view of a part of section 2 of my machine including especially the supply chute for the abrasive material, one of the feed rolls and one of the feed pipes. This Figure 2 is taken on the line 2-2 of Figure 1.

Figure 2a is a view similar to Figure 2 and shows in plan a continuation of section 2 embracing the remainder of the parts of the second unit of my apparatus, including especially the balance of the feed pipes and feed rolls for advancing or moving the article to be polished. This Figure 2a is taken on the line 2a-2a of Figure 1.

Figure 2b is a plan view of a portion of the third section of my apparatus, the parts of this section being duplicates of the parts shown in sections 1 and 2, as my machine will embody, when complete, a series of the structures shown in section 1 of Figure 2. This Figure 2b is taken on the line 2b-2b of Figure 1.

Figure 3 is a sectional view taken through the abrasive feeding roll, its shaft, and the hollow supporting roll adapted to contain a quantity of heat absorbing fluid, as water.

Figure 4 shows the supply chute with its flaring channels in plan view and the abrasive supplying roll located at the lower end of the chute.

Figure 5 is a vertical transverse sectional view of the chamber and its suction pipe which receive the polishing material as it leaves the abrasive feeding roll.

Figure 6 is a vertical transverse sectional view of the housing and suction pipe of the cleansing brush with its sleeve mounted on its shaft, and showing also in cross-section a sheet of the material under treatment and in position to be cleansed by the brush.

Figure 7 is a partial longitudinal vertical section with some of the parts in side view showing a modification of my polishing plant or apparatus.

I will first describe my apparatus for polishing any of the several articles mentioned in the first paragraph of the preamble. I first observe that my apparatus comprises several sections which are essentially duplicates as indicated in Figure 1 by the section of the machinery designated 1 and a part of the next section indicated at 2.

Figure 2 shows the continuation of that part of Figure 1 designated by the numeral 2, and Figure 2a is suggestive of still another section, should any one installation of the machine go beyond the two sections.

I will now describe the machine as shown in Figure 1, first calling attention to that part of the apparatus designated by the numeral 2 in Figure 1 being in practice a part of the unit or second section shown in Figure 2.

An air suction fan 3 is utilized to more or less fill the supply hopper 4x with the abrasive polishing material, while the part 5 of the hopper receives the abrasive polishing material after such material has done its work in the first section of the machine. A supply chute 6 is connected with the hopper 4x through the medium of a gate pipe 7 having a gate 8 to control the flow of the material to the supply chute. This chute, as more fully seen in Figures 2 and 4, comprises an inclined structure 9 divided into flaring channels 10, down and through which the polishing material passes ultimately to the abrasive supplying roll 4, as seen in Figure 1. This supplying roll is rotated by any suitable mechanism to cause it to deliver the abrasive polishing material down upon the article to be cleansed and polished, a sample of which, in the nature of a long sheet of steel or iron I designate 12, and which, in practice, will often be sixty feet or more in length and of such width as such sheet stock is fabricated in rolling mills.

The abrasive cleansing and polishing material is preferably made of emery, carborundum, aluminum oxide or other suitable material.

I will now refer to the rolls which feed or move the article or sheet 12 which is to be cleansed and polished. These rolls are numbered 13 and 13a, companions. Two associate rolls 14a and 14b are also feed rolls. These rolls have the function also of supporting the article or sheet to be treated. It will be understood, of course, that the article in the present illustration, the sheet of

steel or iron, must be moved with reference to the abrasive feeding roll presently to be mentioned, so that the whole area of the article under treatment will travel to, and pass by, the abrasive feeding roll. And the article so placed must also be supported from its under side at a point adjacent the center of the abrasive feeding roll. This supporting and feeding function is preferably performed by a roll 15, yet I may not use the roll 15 for feeding purposes but only for its supporting and heating and cooling purposes now to be mentioned.

As seen in Figures 1 and 3 it will be observed that this roll 15 is hollow and has hollow stub shafts at its ends. Water or other fluid is placed in the roll 15 through one of these shafts as 18 and drained out of the other shaft 18a. These shafts are furnished with screw threads 19 for connection with some suitable devices to furnish the water and drain it off.

In treating some articles it may be desirable to raise the temperature and in treating others it may be preferable to cool them. Accordingly warm water, or cold water, are the preferable mediums and are used for this purpose.

It will be seen from Figures 1 and 3 that the sheet of steel or iron or any other article to be polished is shown at 12 in both figures.

A trough, or box-like structure 16, is used to enclose the lower part of the supply chute and the abrasive supplying roll at 4, as well as the abrasive material, to prevent dust or other things from getting into the abrasive material. And this box or trough also receives and houses the guide 17 which directs another supply of abrasive material to be more fully explained later. This trough also encloses the chamber 20 whose function is to receive the abrasive material as it passes from the abrasive feeding roll for a purpose to be presently mentioned.

This brings me to the abrasive feeding roll 21 which is mounted on a shaft 22 suitably journaled. This abrasive feeding roll at its lower portions is also within the box or trough 16 which prevents the abrasive which it operates on, as well as the operating part of this roll, from being interfered with by dust or other foreign matter. It will be noticed that the periphery of this abrasive feeding roll is located quite close to the sheet or other article which is to be treated. The space between the periphery of this roll and such article is designed to be just sufficient for the desired quantity of abrasive to pass through this space as the article, say the sheet 12, moves to the right while the roll revolves anti-clockwise as shown by the arrow in Figure 1. The speed of the abrasive feeding roll will vary some with changing conditions, but its speed at its periphery will be about 1,000 times faster than the movement of the article under treatment, say the steel or iron sheet 12, and will make the preferred speed of the article about six feet per minute. This will make the preferred speed of the roll about 2,000 revolutions per minute, using a 12-inch diameter roll.

It will be understood that as the article under treatment moves to the right in Figure 1, it will carry the abrasive material, from one or both sources, the abrasive supplying roll 4 and/or the guide 17. And when this material reaches near the abrasive feeding roll, the movement of the abrasive will be of a speed substantially that of the rotation of the abrasive feeding roll, so as to create in the abrasive a cleaning and/or polishing action on the article under treatment. The

abrasive feeding roll has an inducing or suction action on the abrasive material due to the high speed of rotation of the roll. The roll tends to draw air between its periphery and the suction hood 23 through the narrow space between the roll and the hood. This sucking or inducing action of the roll accelerates the movement of the abrasive way beyond the rate of movement of the article. In other words, the abrasive material when it comes under the influence or action of the high speed abrasive feeding roll is kept constantly in a state of movement and contact with the article under treatment, and under these circumstances the article, say a sheet of steel or iron, is so treated that it will become clean and free from rust, scales and other blemishes and assume a polished and bright finish, put on it by the combined action of the abrasive and the abrasive roll.

The particles of the abrasive material become finer or smaller after they have served the cleansing and polishing of the article and the abrasive is taken up into the chamber 20 as best seen in Figure 1. The arrows show the general course of movement of the abrasive as the same is blown upward through the suction tube 24 past the adjustable gate 25 and thence into the main suction tube 26, on back to the hoppers 4x and/or 5.

From the hopper 4x some of the abrasive material travels again down the supply chute 6 to the supplying roll 4 and thence to the article under treatment, while another portion of the abrasive passes from the hopper 5 through the gate 27 and the feed pipe 11 which discharges the abrasive upon the guide 17 whence it again reaches the sucking influence of the abrasive feeding roll and is utilized again in cleansing and polishing the article.

The abrasive feeding roll 21 tends to draw air between its periphery and the hood 23 through the narrow space between the roll and the hood. A branch tube 29 extends downward from the main suction tube 26 to the area designated 28. The effect of this is to control the quantity of air entering the guide 17 and thereby control the acceleration movement of the abrasive. These controls are regulated by the adjustable gate 30.

As some of the abrasive material will lodge on the article under treatment, say the steel or iron sheet 12, and as some of the debris taken from the article will both adhere somewhat to the article or sheet under treatment, I have provided a device to divest the article of such debris which is mingled more or less with small particles of the abrasive. This device is composed of a shield or enclosure 31 within which is mounted a shaft 32. This shaft carries a cleaning brush and rotates in the direction shown by the arrow in Figure 1. The material taken up by the brush 33 with its soft bristles enters the lift tube 34 and by adjustment of the gate 35 this material passes on into the main suction tube 26, and thence into one or both of the hoppers and back to the abrasive roll and the article under treatment, to be used again.

From what has been thus far stated, it will be seen that my apparatus is endowed with the capacity to rapidly and efficiently change the surfaces of various articles, among them the one selected for illustration in my drawings, namely, a sheet of steel or iron, indicated at 12, from an unclean and more or less discolored surface to a new surface, smooth and bright. And these op-

erations are conducted rapidly so that the articles treated quickly pass through the machine in their bright and desired condition on their selected surface.

5 In some cases the articles can be thus treated by passing through one unit of my apparatus, such as that shown in Figure 1 excluding the portion indicated at 2, which belongs to another unit.

10 Presently I shall refer to the several drawings which show the apparatus is so built that one or more units may be in operation at the same time on different articles to be treated, or that the articles that are very long, say a sheet of steel or iron, or a bar of these materials of length more than one unit can be treated by one or more successive units to be more fully explained presently.

Referring now to the composition or material and construction of the abrasive feeding roll, we call special attention to Figures 1 and 3 with respect to the structure and to Figures 2 and 2a for the preferred position of the abrasive feeding roll, namely, at a slight angle to the direction of movement of the article under treatment.

25 First, as to the material of which the abrasive feeding roll is preferably made. I mention for this purpose emery, corborundum, aluminum oxide and any other suitable material to cause this roll to feed abrasive material to the articles to be treated, and particularly so treating long sheets of steel and iron to give them a polish on their upper face, a condition which is commercially called for in the use of these long and comparatively narrow products of steel or iron or other materials. I fabricate my abrasive roll 21 of separate individual discs numbered 36, 37, 38 and 39. Two of these discs 36 and 39 have one side thereof at an angle to make them fit the inclined sides of the remaining discs 37 and 38. Again, to make the axial dimension of all the discs a certain distance, one outer disc 36 has its thickest portion on the periphery at the top of that disc as shown in Figure 3; and likewise the last disc 39 has its lower part thickened to compensate for the thinner portions of the disc 36.

45 The reason for making the abrasive feeding rolls 21 of separate discs is that it would be impractical to try to make the rolls 21 of one solid piece of material as the length may need to be as much or more than five feet. I, therefore, contemplate making it of a series of several discs of desired thickness to equal the length of the roll. The two end discs would have the sides at angles as above described.

55 Another feature of my abrasive feeding rolls is with reference to mounting them at a slight angle to a sheet of steel or iron under treatment. This slight angle is clearly shown in Figures 2 and 2a. And it will be understood also that the axis of one roll, say 21, directs the lines between the sections 36 to 39 of the roll, at an angle to the sheet of steel or iron; and that the axis of the roll, say 21a, directs the lines between the sections 36a to 39a of the roll 21a at a reverse angle to the sheet of steel or iron.

Or, in some instances, I may prefer to make the discs which compose the abrasive feeding roll with their sides at right angles to the shaft 22 in which case there would be no discs having sides at an angle to said axis other than a right angle.

Referring now to installations in which more than one section of my apparatus is used, I direct attention to Figure 2. Section 1 of Figure 2

shows a plan view of the end of the sheet 12 of steel or iron to be polished; the feed roll 13; the supply chute 6 comprised of the inclined structure 9 divided into flaring channels 10. This section 1 also comprises the abrasive supplying roll 4; the feed pipe 11; the suction pipe 29; the suction hood 23; the abrasive feeding roll 21 mounted on the shaft 22 and composed of the separate individual discs 36, 37, 38 and 39; the suction tube 24 and the chamber 20; the lift tube 34 and the cleansing bristles 33 within the enclosure 31 and the feed roll 14.

Section 2 of Figure 2 shows a plan view of the supply chute 6a, comprised of the inclined structure 9a divided into flaring channels 10a; the feed pipe 11a and a part of the abrasive supplying roll 4a. A continuation of this section is shown in Figure 2a and comprises a plan view of the remainder of the supplying roll 4a, the suction pipe 29a, the hood 23a; the abrasive feeding roll 21a mounted on the shaft 22a and composed of the discs 36a, 37a, 38a and 39a; the suction tube 24a and the chamber 20a; the lift tube 34a and the cleansing bristles 33a within the enclosure 31a and the feed roll 14c.

In Figure 2b we come to a portion of section 3 of the apparatus, comprising the supply chute 6b with its inclined structure 9b divided into flaring channels 10b. This portion of section 3 also shows the abrasive supplying roll 4b; the feed pipe 11b; the suction pipe 29b; the abrasive feeding roll 21b mounted on the shaft 22b and composed of the separate individual discs 36b, 37b, 38b and 39b. I have not deemed it necessary to show more than these parts of section 3, because the remaining parts of that section are the same in structure and function as the corresponding parts shown in sections 1 and 2 in Figures 2 and 2a.

Referring now to Figure 7 of the drawings, it will be seen that I have shown a modification of my apparatus. The modification comprises the same mechanism with minor omissions and performs in the same manner as do the corresponding features or parts shown in the other figures of the drawings, except that in the modification, the rolls are mounted in inclined planes and the article to be cleansed and polished, such as the sheet of steel or iron, occupies an inclined position.

In the modification there are three hoppers designated 40 which receive the abrasive material that is to be fed through gate pipes 41 down into a supply chute 42. It is then fed upon the article to be treated, such as the metallic sheet, by supplying rolls designated 43. The article 44 to be treated is supported and fed down the incline by the feed rolls 45 and 46 which are located at intervals so as to keep the article under treatment in perfect position with reference to the other elements. There are also supporting and feeding hollow rolls 47 which function to support the article under treatment and to permit it to glide or slide slowly down its incline. These supporting and feeding hollow rolls may, or may not, be filled with a heat absorbing material, such as water, as in the case already stated and shown by the numerals 15, 18 and 18a. The modification also includes the brush chambers and their enclosed brushes designated as a whole by the numeral 48, whose function is the same as set forth above and designated by the numerals 32 and 33. In this modification the discharge tubes 49 connected with the brush housings are extended below the

article under treatment while in the main form of the structure, the discharge or lift tubes extend upward from the brushes and their housings.

The modification also includes the chamber 50 for gathering the abrasive material as it passes from the large abrasive feeding rolls 51. A discharge tube 52 extends downward from the chamber to discharge the abrasive material as it gathers in the chamber. The large abrasive feeding rolls 51 perform essentially the same functions as the abrasive feeding rolls 21 shown in the main assembly of the apparatus. These abrasive feeding rolls are preferably constructed in a series of discs as those in the main assembly and are also made with any of the same materials heretofore set forth.

Summarizing somewhat the detailed statements of the functions of each of the several parts of my apparatus, particularly as shown in Figures 1, 2 and 2a, I now will give a résumé of the mode of operation.

The abrasive material, of any of the several kinds before referred to, is fed by gravity from the hopper 4x to the supply chute 6 and delivered to the supplying roll 4 and thence to the article under treatment. The suction effect of the abrasive feeding roll 21 in Figure 1 tends to draw the abrasive material toward such rolls, which induced movement of the abrasive is also contributed to by the movement of the article under treatment. The space between the periphery of such abrasive feeding rolls and the article under treatment is comparatively small so that the abrasive is sufficiently pressed upon or squeezed against the article to make it bite or cause its contact with the article to be effective for removing any scales or other debris on the article as well as cleaning the article and polishing it.

Thus in some instances, I do my cleaning and polishing with the quantity of abrasive material fed by one abrasive feeding roll and the remainder of the cooperating mechanism; while in other instances, I will employ or require the quantities of abrasive material fed by two or more of the abrasive feeding rolls and their cooperating mechanism. As the article under treatment passes along under the first abrasive feeding roll, it loses the abrasive material which gathers in the chamber 20 and thence goes up the suction tube 24 and on through the suction pipe 26 and empties in the hoppers 4x and 5, while the article itself is passing on for contact with the cleaning brush 33. From this point the abrasive material passes up the lift tube 34, past the gate 35 and on into the tube 26 and thence to the hoppers 4x and 5, where the suction created by the fan 3 is utilized also to draw the abrasive into the hoppers.

Again the current of air induced by the abrasive feeding roll 21 is drawn through the open space between the periphery of the roll and the suction hood 23, continues in part downward between the roll and the guide 17, while the rest of this current of air will yield to the suction created by the motion of the material passing through the tube 36. This induced current will join with the current passing through tube 26 and participate in delivering the abrasive in tube 26 to and into the hoppers 4x and 5.

The article being then treated is concurrently conveyed on to section 2, shown as a part of Figure 1. In that section and the succeeding sections the article is further treated in the same

manner and by the same means as above stated, until it has been polished—whether by a part or all of the abrasive material fed by the several abrasive feeding rolls, and the mechanism associated with each one.

I sometimes, but not always, position the shaft of each abrasive feeding roll at a slight angle, as best shown in Figures 2, 2a and 2b, to induce the abrasive material contacting with the rolls to travel slightly to the left from one roll and to the right from the next roll and so on. This slight angle above mentioned is to cause the scouring, cleaning or polishing action to be cross-wise, first to the right and then to the left, to prevent the abrasive action of the adjacent abrasive feeding roll 21 following in the same minute grooves that the preceding roll may have made, thus producing a smoother finish and avoiding grooves and other blemishes.

Again, it will be understood that the several abrasive feeding rolls may have different peripheral surfaces in point of finish so that one abrasive feeding roll will, with its appropriate abrasive, merely roughly grind the article; another feeding roll, with its appropriate abrasive, will smoothly grind the article; the third feeding roll, with its appropriate abrasive, will roughly polish the article; the fourth feeding roll, with its appropriate abrasive, will smoothly polish the article, and the fifth feeding roll (if that many units are used), with its appropriate abrasive, will lustrously polish the article, and so on until the desired finish is obtained, by one abrasive feeding roll or two, or three, or more, according to what state of finish or polished surface it is desired to impart to the article; these steps being consecutive, or intermittent, or stopping with one or another of the abrasive feeding rolls, as may be desired.

I will now refer to the mode of operation and results carried on and performed in this modified structure. The article to be treated moves relatively slowly down the incline, controlled by the feed rolls. The abrasive material, which also is of any of the materials specified above in this specification, is fed by the supplying rolls down upon the article to be treated, such as the steel plate designated 44. As the article to be treated slowly moves down the incline, and the abrasive material moves along with the article, the abrasive feeding rolls 51, revolving at high speed, such as stated in an earlier part of this specification, in the reverse direction from the travel of the article and the downwardly moving abrasive (see the arrows adjacent the abrasive rolls 51, which indicate the direction of their swift movement), the periphery of the rolls being close to the article under treatment and the abrasive material occupying that small space, cause the abrasive feeding rolls to sweep and press the abrasive along and against the article. This results in thoroughly cleansing the article and polishing it on the surface next to the abrasive feeding rolls. And this treatment is repeated with the abrasive material at each successive roll so that in the course of the article through the machine, it is cleaned, smoothed and highly polished.

In Figure 1 I have shown, by an arrow, that the metal sheet or other article moves in the direction of the movement of the abrasive feeding roll 21 as it passes the article. But the article may be moved in a contrary direction from that of the roll at the working point. Likewise in Figure 7, while I have shown an arrow indicating

that the article travels in a reverse direction from the working point of the abrasive feeding roll 51, I may move the article in the same direction of movement of the roll at the working point.

5 Thus it will be seen that both in the main assembly or construction and in the modified form the same functions are performed by the same mode of operation by practically the same mechanism with the exception that in the modified
10 form the article to be treated is in an inclined position and the abrasive feeding rolls are mounted in a plane essentially parallel to that of the material. But the treatment of the article and the arrangement of the abrasive material and the
15 action of the abrasive feeding rolls are the same as in the main form of the apparatus.

It will be understood that the above described structure is merely illustrative of the manner in which the principle of my invention may be
20 utilized, and that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

Having thus fully described my invention, what I claim is new and desire to secure by Letters
25 Patent, is:

1. The combination with a hopper, a chute, a support for the article to be acted on, a supplying roll being adapted to supply an abrasive on
30 the article, an abrasive feeding roll spaced above the article and operating to manipulate the

abrasive material to cause it to act on the article, a chamber near said feeding roll to receive the abrasive driven by the roll, a suction tube connecting the chamber with the hopper, and the
5 hopper adapted to re-supply the abrasive to the abrasive feeding roll to deliver abrasive material to the hopper, a rotative brush adapted to cleanse the article under treatment and a lift tube to receive and deliver the debris from the brush and convey it to the hopper.
10

2. The combination with a rotatable abrasive feeding roll, of a hood mounted near the feeding roll with an air entrance space between the feeding roll and the hood, whereby an air current is induced by the speed of rotation of the
15 feeding roll, and a pipe leading from said hood to a hopper, said hopper adapted to deliver the abrasive material to the feeding roll and near the hood, the air rush created by the rotation of the feeding roll in part acting to produce air
20 currents through said pipe to aid in said pipe delivering abrasive material to the hopper.

3. The combination with an abrasive feeding roll, of a supporting roll to maintain the article under treatment in a space between the two rolls,
25 the interior of the supporting roll constituting a chamber to carry water or other cooling medium to counteract the heat created by the active parts.

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