No. 647,485. Patented Apr. 17, 1900.

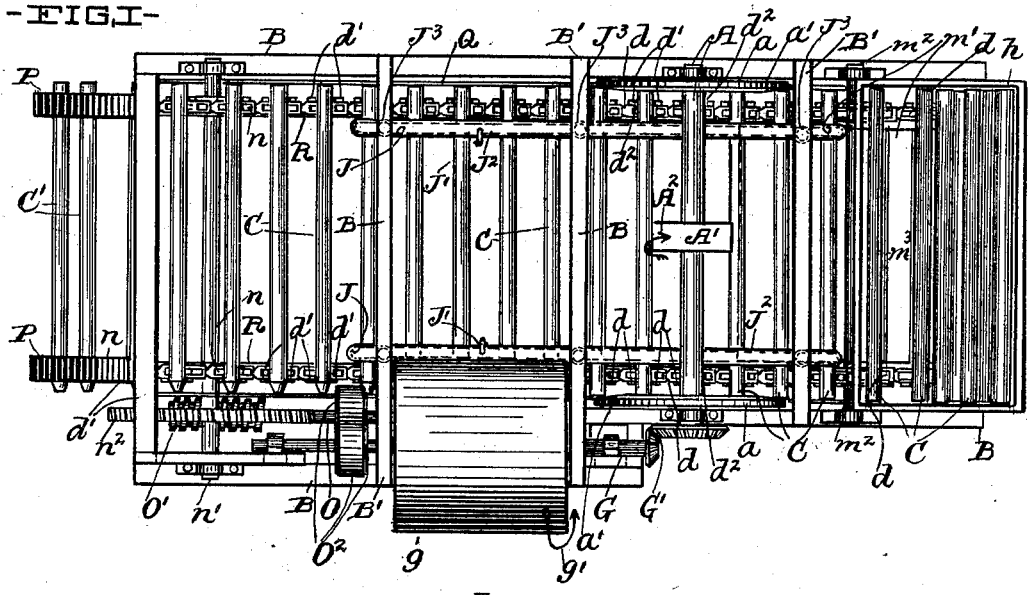
J. B. EBERLING.

GRINDING MACHINE.

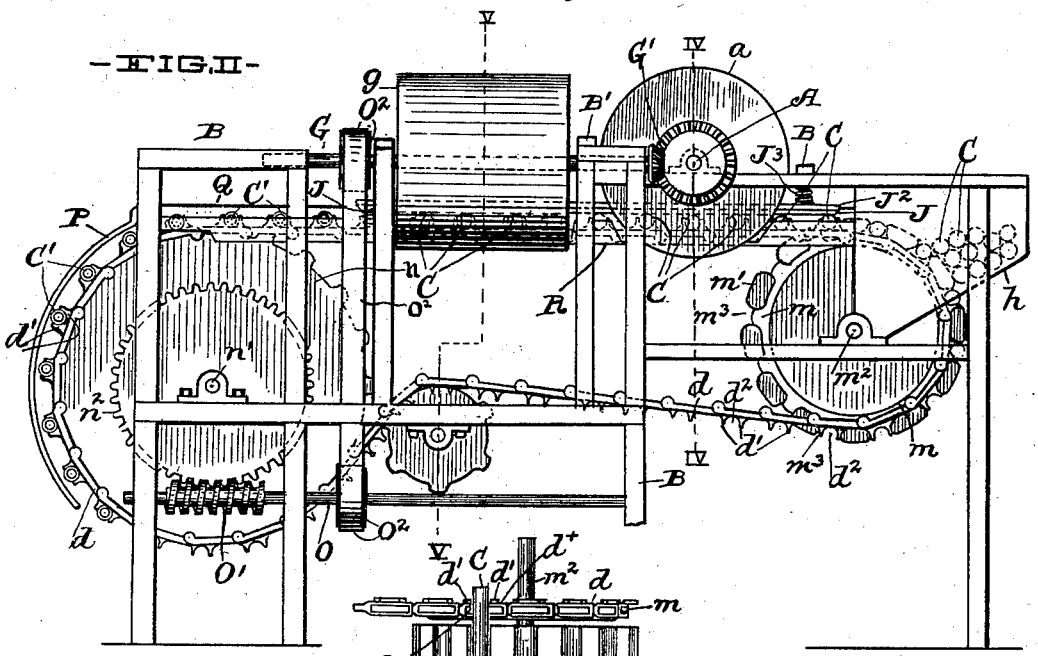
(Application filed Sept. 17, 1898.)

(No Model.) 2 Sheets—Sheet 1.

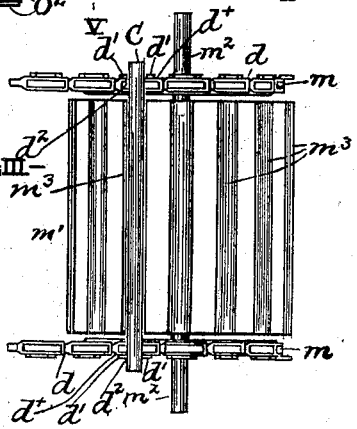
-FIG. I-



-FIG. II-



-FIG. III-



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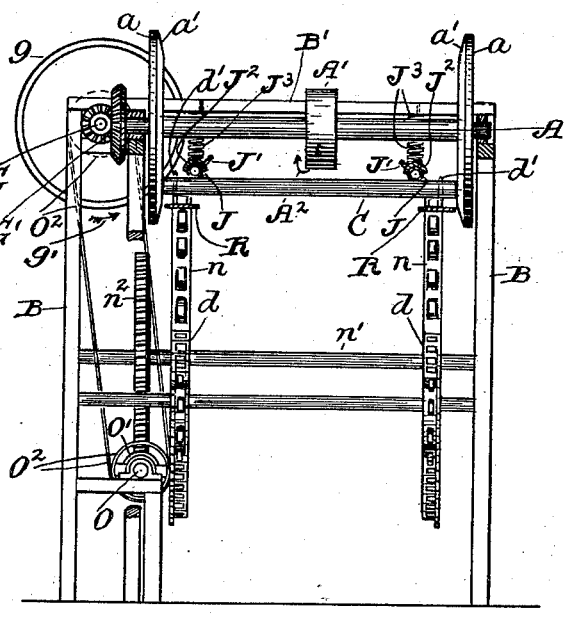
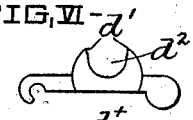
(No Model.) 2 Sheets—Sheet 2.

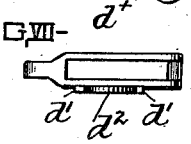
—FIG. IV—



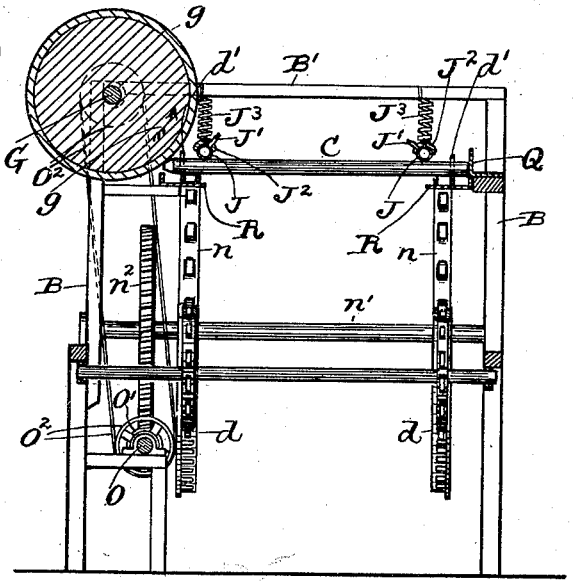
—FIG. VI—



—FIG. VII—



—FIG. V—



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UNITED STATES PATENT OFFICE.

JACOB B. EBERLING, OF LAKEWOOD, OHIO, ASSIGNOR OF ONE-THIRD TO ALBERT E. LYNCH AND CHARLES H. DORER, OF CLEVELAND, OHIO.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 647,485, dated April 17, 1900.

Application filed September 17, 1898. Serial No. 691,136. (No model.)

To all whom it may concern:

Be it known that I, JACOB B. EBERLING, residing at Lakewood, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Grinding-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to grinding-machines more especially adapted for use in the manufacture of carbons designed for use in arc-lamps; and the invention more especially pertains to a machine for squaring and pointing or shaping the ends of carbon blanks.

In the accompanying drawings, Figure I is a top plan of a machine embodying my invention. Fig. II is a side elevation of the machine. Fig. III is a top plan showing the carbon-blank-receiving drum and the carbon-blank-conveying chains that engage sprocket-wheels operatively connected with the drum. Fig. IV is a transverse vertical section on line IV IV, Fig. II. Fig. V is a transverse vertical section on line V V, Fig. II. Fig. VI is a side elevation of a link of the chains. Fig. VII is a top plan of the said link.

My improved machine comprises two grinding-disks *a a*, that are arranged to operate upon opposite ends, respectively, of the carbon blanks. Disks *a a* are preferably arranged vertically and longitudinally of the machine and are operatively mounted a suitable distance apart upon a suitably-rotated shaft A, that is supported in any approved manner and arranged horizontally and transversely of the stationary framework B of the machine. The two grinding-disks *a a* preferably correspond in shape and diameter, and the path along which are fed the carbon blanks C, that are to be squared at their ends and pointed, tapered, or rendered conical at one end, extends between the said disks. As the different disks *a a* are arranged to operate, therefore, at opposite sides, respectively, of the said path the blanks are fed laterally and in a horizontal plane between the disks. The inner or opposing surfaces of the grinding-disks are the latter's grinding-surfaces, and I would remark that although I have shown the disks arranged in line axially my invention would embrace also a machine having the said disks arranged also a distance apart longitudinally of the path of the blanks. For the purpose hereinafter made apparent the said path extends between the said disks, preferably at an elevation between the lower extremities and axes of the disks.

Two suitably-supported endless chains *d d* are employed to feed the blanks from the supply-hopper *h*, that is provided at the forward end of the machine, to and between and beyond the grinding-disks *a a* and past the inner side of a grinding-drum *g*, that is arranged horizontally and longitudinally of the left-hand side of the machine and is operatively mounted upon the shaft G, that is correspondingly arranged and supported in any approved manner from the framework B. The drum *g* has a peripheral grinding-surface and is designed to point, taper, or render conical one end of the blanks after the latter have been operated upon and passed rearwardly beyond the grinding-disks *a a*. The drum *g* and shaft G, respectively, are arranged, therefore, at right angles to the disk-bearing shaft A, and the drum-bearing shaft is intergeared with the disk-bearing shaft, as at G'. The disk-bearing shaft is driven in any suitable manner and in the case illustrated is provided with a driving-pulley A', to which power is applied in any approved manner. It will be understood, therefore, that the ends of the blanks are ground and squared by and between the disks *a a* and that the blanks at one end are pointed, tapered, or rendered conical by the drum *g*. The blanks will vary somewhat in length, and to prevent, therefore, the slightest variation in the lengths of blanks from interfering with their free ingress into the space between the grinding-disks the inner and grinding surface of each of the grinding-disks is beveled, as at *a'*, next adjacent to the disk's periphery, so that the inner and grinding surface shall slope inwardly from the periphery a suitable distance. The central portions of the opposing and grinding surfaces of the two grinding-disks are parallel and perpendicular to the path along which the blanks are fed, and the beveled surfaces *a'* slope outwardly from the

said perpendicular surfaces and cause the space between the disks to be gradually enlarged toward their peripheries, and consequently toward their forward extremities, and the gradual enlargement of the said space forwardly next the peripheries of the disks facilitates the passage of the blanks between the disks, and a slight endwise displacement of the blanks upon the blank-feeding chains and slight variations in the lengths of blanks will not interfere with the passage or introduction of the work between the grinding-disks. The upper sections of the chains *d d* have the elevation required, as already indicated, to convey the work between the opposing and perpendicular grinding-surfaces of the grinding-disks, and the disks are located the distance apart required to enable their said opposing and perpendicular grinding-surfaces to operate upon the shortest work that is likely to pass between the two disks. The grinding-disks are preferably large enough diametrically to render them capable of operating simultaneously upon several blanks, as shown in Figs. I and II.

The grinding-drum *g*, as already indicated, has the arrangement required to point, bevel, or taper the blanks at one end of the blanks and is preferably long enough to operate simultaneously upon several blanks, as shown in Figs. I and II. Drum *g* in the case illustrated is located a short distance rearward of the left-hand grinding-disk *a* and has its peripheral grinding-surface extending into the left-hand side of the work's path above the center of the left-hand extremity of the said path, so that the left-hand ends of the blanks as the latter traverse the grinding-surface of drum *g* are pointed, beveled, or tapered. The drum *g* is rotated in the direction indicated by the arrow *g'* in Figs. IV and V, so as to cause its grinding-surface to grind upwardly and not bear downwardly upon the work during the grinding operation, and consequently to positively avoid breakage or mutilation of the blanks. The driving-pulley A' is rotated, therefore, in the direction indicated by the arrow A^2.

Each blank-feeding chain *d* is composed of links that are assembled or connected together in any approved manner, and the chains at the forward end of the machine lead over sprocket-wheels *m m*, that are operatively formed upon or connected with opposite ends, respectively, of the blank-receiving drum *m'*, that is arranged to receive the blanks from the hopper *h*, and has its trunnions m^2 supported from the framework B in any approved manner. The work-conveying chains at the machine's rear end engage and lead over different sprocket-wheels *n n*, respectively, that are operatively mounted upon the shaft *n'*, that is arranged horizontally and transversely of the machine and is supported in any approved manner from the framework B. A worm-wheel n^2 is operatively mounted upon the left-hand end of the shaft *n'* and meshes with a worm O', that is formed upon the shaft O, that is arranged longitudinally of the machine and supported and driven in any approved manner. Motion is transmitted, therefore, to the blank-feeding chains from the shaft O through the medium of worm O', worm-wheel n^2, shaft *n'*, and the sprocket-wheels *n*, and motion is transmitted from the chains to the blank-receiving drum *n'* through the medium of the sprocket-wheels *m*. The worm-shaft O is operatively connected with the drum-shaft G by the pulleys and belt O^2, and the arrangement of the parts operatively connecting the shaft G with the chains *d* is such that the latter are actuated in the direction required to convey the blanks from hopper *h* to the grinding-place. A link $d^\times$ of the chains is shown detached in Figs. VI and VII. Each link upon its outer side is provided with two upwardly-projecting lugs *d' d'*, arranged a suitable distance apart lengthwise of the link, so as to form a recess d^2 above the link's body portion for the reception of one end of the blank, and I would here remark that the blank-receiving recess d^2 of each link in each chain is arranged in line transversely of the machine, and consequently registers with a recess in a link of the companion chain, so that each blank in its passage through the machine has bearing in each of the chains, and the upwardly-projecting lugs of the chain-links prevent lateral displacement of the work forwardly or rearwardly of the chains during the grinding operation and at other times and form also means for supporting the blank or work in the latter's passage to and from the horizontal plane along which the work passes preparatory, during, and after the grinding operations.

Two yielding bars J J are arranged above and longitudinally of the work's path and a suitable distance apart widthwise of the said path. Members J J extend, preferably, from a point a short distance forward of the grinding-disks *a* rearwardly to and a short distance beyond the rear extremity of the grinding-drum *g*. The said yielding bars prevent upward displacement of the carbon blanks or work during the grinding operation and accommodate any unevenness or crookedness in the blanks. Each bar J consists, preferably, of a pneumatic tube composed of rubber or other suitable material and closed at the ends and provided at any suitable point with a valve J', at which air is introduced for the inflation of the tube. Each member J is secured to and covered or embraced at the top by a half-round bar J^2, composed of stiff material and extending lengthwise of the pneumatic member J, and any suitable number of suitably-applied springs J^3, arranged at suitable intervals lengthwise of the said bar J^2, are confined between the said bar J^2 and a stationary bar B' of the framework B. The springs J^3 are suspended from the bars B' and attached to the bars J^2. Springs J^3 and

the members J and J^2, suspended by the springs, form yielding devices that prevent upward displacement of the work during the grinding operations, and the pneumatic members J are particularly desirable because of the facility with which they can accommodate themselves to crooked or uneven blanks. Furthermore, the friction had between bars or members J and the blanks during the grinding operations will cause the blanks that are carried by the chains or conveyer in the one direction to be rotated in the opposite direction, as required to enable the grinding-drum g to operate upon all sides of the blanks and form the desired cone or taper upon the blanks.

The blanks within the hopper h rest upon the drum m, and the hopper straddles the said drum and connected sprocket-wheels and chains. The drum m' in its peripheral surface has grooves m^3, arranged at suitable intervals circumferentially of the drum and extending longitudinally and from end to end of the drum. Each groove m^3 has the width and depth required to receive one blank only, and consequently only one blank at a time is fed laterally from within the hopper. The drum-grooves m^3 register with recesses d^2 in the chains, and the relative arrangement of the grooves in the drum and the registering recesses in the chains is such that the blanks that are received by the drum from the hopper before they are conveyed rearwardly from within the hopper shall have bearing upon the walls of the drum-grooves, so as not to be broken by the weight of other blanks in the hopper.

The finished blanks or carbons C' are conveyed by the chains adown the rear end of the machine and are deposited at or near the lower extremities of the sprocket-wheels n into any receptacle (not shown) that is provided to receive them. To prevent the carbons from falling out of the recesses or pockets d^2 of the chains during the descent of the carbons at the machine's rear end, I provide guards P, that are arranged concentrically of and in close proximity to the chains' paths around the rear portions of the sprocket-wheels n.

To prevent endwise displacement of the carbon blanks, especially during the operation upon the blanks by the taper-grinding device g, I provide a suitably-supported bar Q, that extends longitudinally of the supporting-framework at the latter's side that is opposite the frame's side that bears the said grinding device, and in the case illustrated, therefore, the said bar Q is arranged at the right-hand side of and close to the work's path and extends the full length of and forwardly and rearwardly beyond the said grinding device and forms an abutment or end stop for the blanks that are being operated upon by the said grinding device. Suitably-supported bars R are also provided and arranged as required to form a bearing for the chains d.

What I claim is—

1. In a grinding-machine of the character indicated, the combination with a suitably-actuated endless conveyer that is narrower than the length of the carbon blanks or work adapted to be received upon, and transversely of, the conveyer; of two suitably-supported and suitably-operated grinding-disks said disks having slightly-convex opposing grinding-faces arranged at opposite sides, respectively, of the aforesaid conveyer for operating upon the ends of the carbons, substantially as and for the purpose set forth.

2. In a grinding-machine of the character indicated, the combination with a suitably-supported and suitably-rotated shaft; of two parallel grinding-disks corresponding in size diametrically and operatively mounted upon the shaft so that the plane of their rotation will be at right angles to the work and arranged the distance apart required to render the disks capable of operating upon opposite ends, respectively, of the blanks or work passed between them, said disks being provided with convex grinding-surfaces on their interior or opposing faces and a suitably-actuated conveyer for feeding the blanks or work laterally and horizontally to, and between the said disks.

3. In a grinding-machine of the character indicated, the combination with two suitably-supported and suitably-rotated grinding-disks having opposing parallel grinding-faces, said disks being arranged the distance apart required to render them capable of operating at right angles to and upon opposite ends, respectively, of the blanks or work passed between them laterally; of two suitably-supported and suitably-actuated work-feeding chains for receiving and carrying the work between the disks, which chains are arranged the distance apart required to render them capable of affording bearing for opposite end portions, respectively, of the work and means for preventing both vertical and lateral displacement of the work upon them.

4. In a grinding-machine of the character indicated, the combination with the grinding devices, and a hopper having a discharge-opening at its lower end; of a peripherally and longitudinally grooved drum and two sprocket-wheels operatively connected with opposite ends, respectively, of the drum, said sprocket-wheels having their driving-faces of less diameter than the diameter of the drum; endless chains engaging the sprocket-wheels, and having formed therein recesses arranged to register with the recesses in the drum, and means for actuating the chains, all arranged and operating, substantially as shown, for the purpose specified.

5. In a carbon-grinding machine of the character indicated, the combination with the work-feeding device adapted to receive the blanks or work transversely thereof; and two suitably-supported and suitably-operated grinding-disks arranged to operate upon the

opposite ends, respectively, of the work and having opposing parallel grinding-faces, beveled toward their peripheries; of a suitably-supported and suitably-operated rotary grinding device arranged at one side of the conveyer and having its grinding-surface extending into the path of an end of the blank or work alongside the center of said path, its plane of rotation being at right angles to the path of the work, substantially as and for the purpose set forth.

6. In a grinding-machine of the character indicated, the combination with a suitably-actuated device for feeding the blank or work laterally; of a suitably-supported rotary grinding device having such arrangement, relative to the path of the work-feeder and work conveyed by the said feeder, as to grind a taper or conical form upon one end of the work, and means for rotating the grinding device in the direction required to cause the said grinding device to grind upwardly, and a cushioned bar for holding the carbons against the grinding-surface, substantially as shown, for the purpose specified.

7. In a grinding-machine of the character indicated, the combination with two suitably-operated parallel chains arranged a suitable distance apart and having work-receiving recesses arranged as required to receive the work upon the chains; of a cushioned horizontal bar arranged above and in contact with the carbons, to prevent the displacement of the carbons from the conveyer, substantially as described, for the purpose set forth.

8. In a grinding-machine of the character indicated, the combination with the work-feeding chains arranged a suitable distance apart; of two pneumatic bars arranged above and in close proximity to the work's path and a suitable distance apart widthwise, and extending longitudinally, of the said path, said bars being supported by a coiled spring so as to be movable in a vertical direction only, substantially as and for the purpose set forth.

9. In a grinding-machine of the character indicated, the combination with the work-conveyer; of a bar arranged to prevent displacement of the work from the conveyer, and springs confined upon the bar's side that is opposite the conveyer-facing side of the bar, substantially as and for the purpose set forth.

10. In a grinding-machine of the character indicated, the combination with the carbon-blank conveyer, two grinding-disks arranged at opposite sides, respectively, of the path of the work, in position to operate upon opposite ends, respectively, of the blank, and another grinding device arranged alongside of the said path and in position to grind a taper upon one end of the blank; of yielding bars having the length and arrangement required to prevent displacement of the work from the conveyer during the grinding operations, said bars having springs for holding them against the work, substantially as described, for the purpose set forth.

Signed by me at Cleveland, Ohio, this 1st day of September, 1898.

JACOB B. EBERLING.

Witnesses:
C. H. DORER,
A. H. PARRATT.