No. 623,036. Patented Apr. 11, 1899.

C. T. RICHMOND & M. M. ZELLERS.

CARBON SORTING MACHINE.

(Application filed Mar. 26, 1898.)

(No Model.) 2 Sheets—Sheet 1.

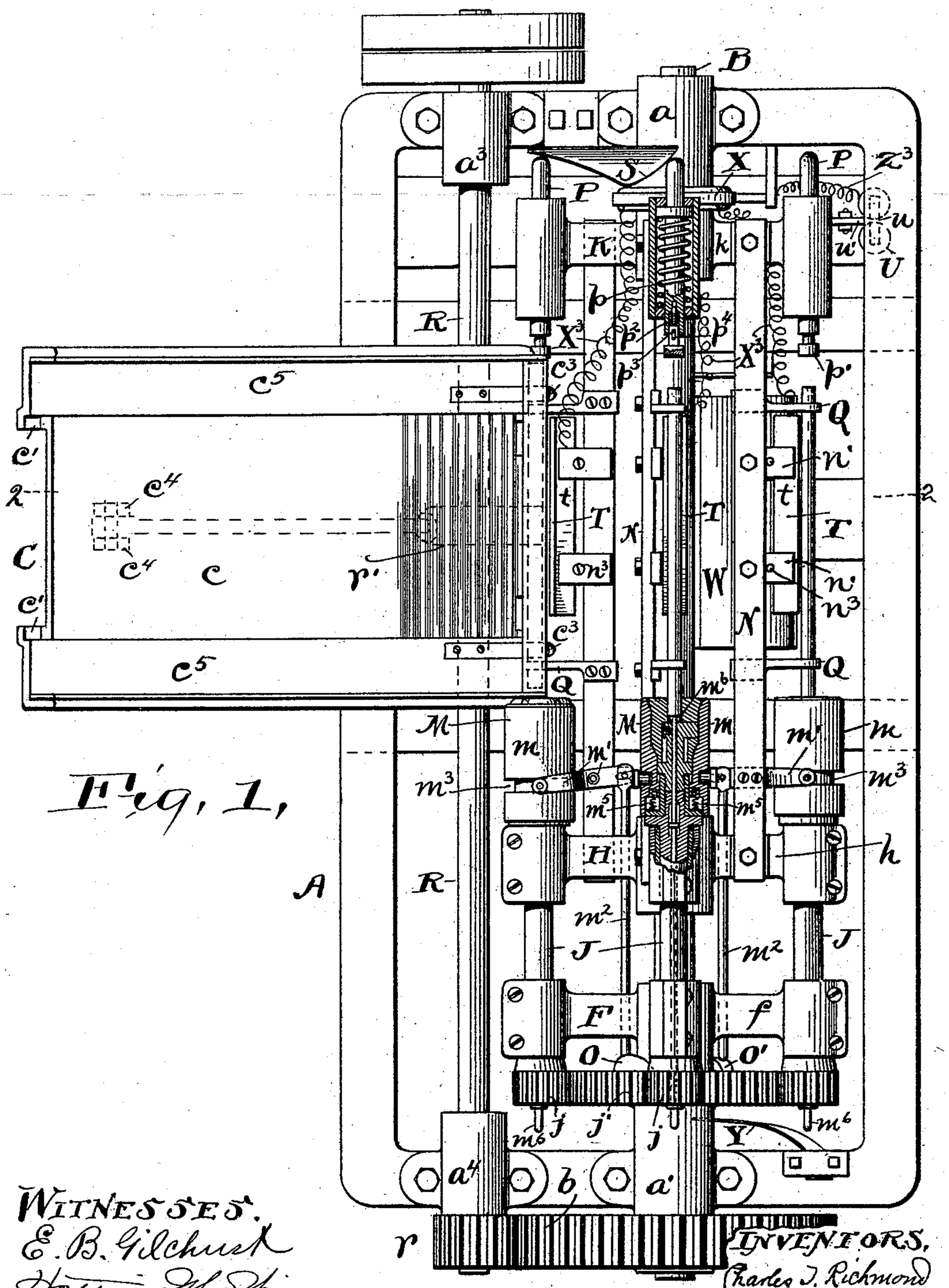

Fig. 1.

A

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Fig. 2.

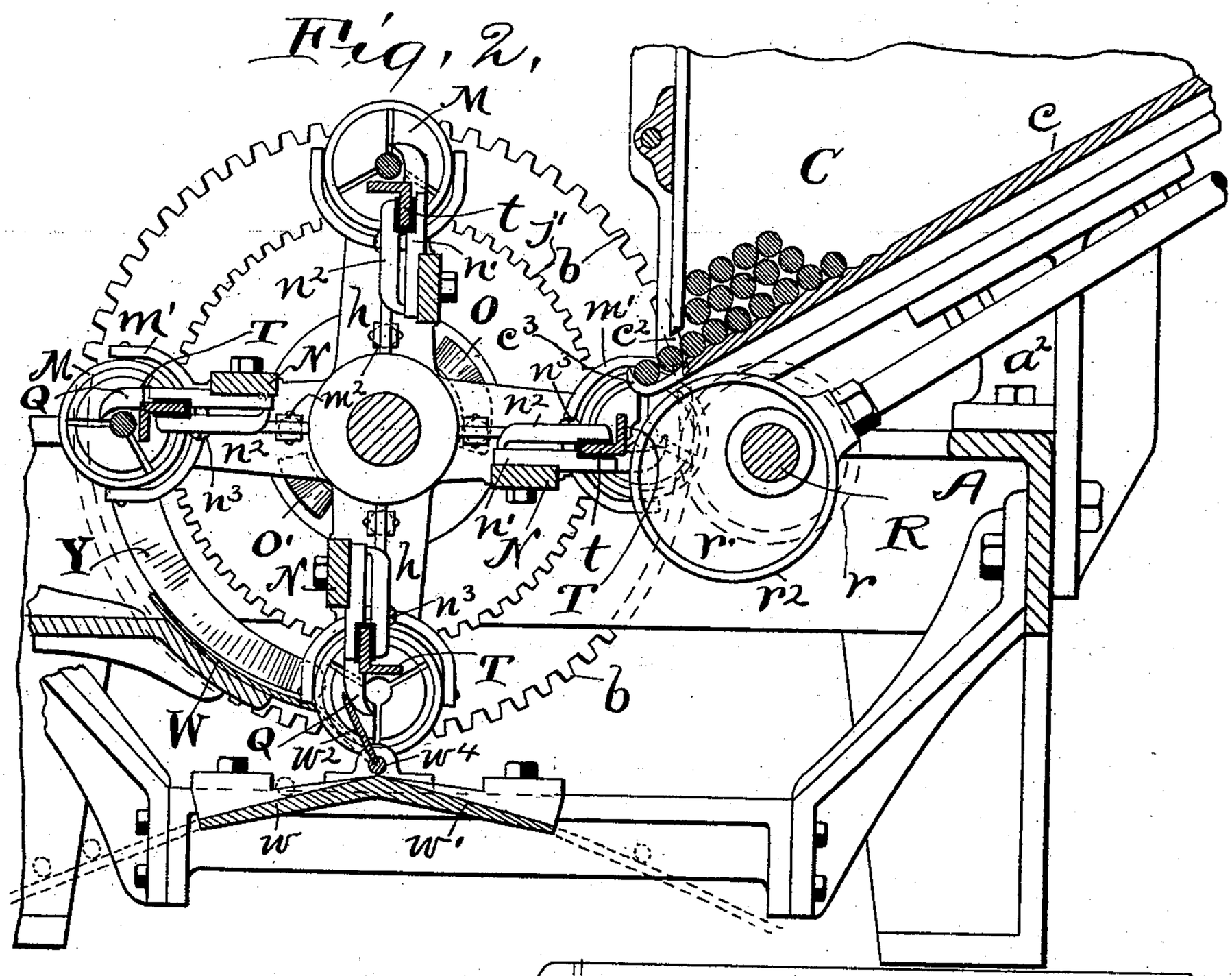
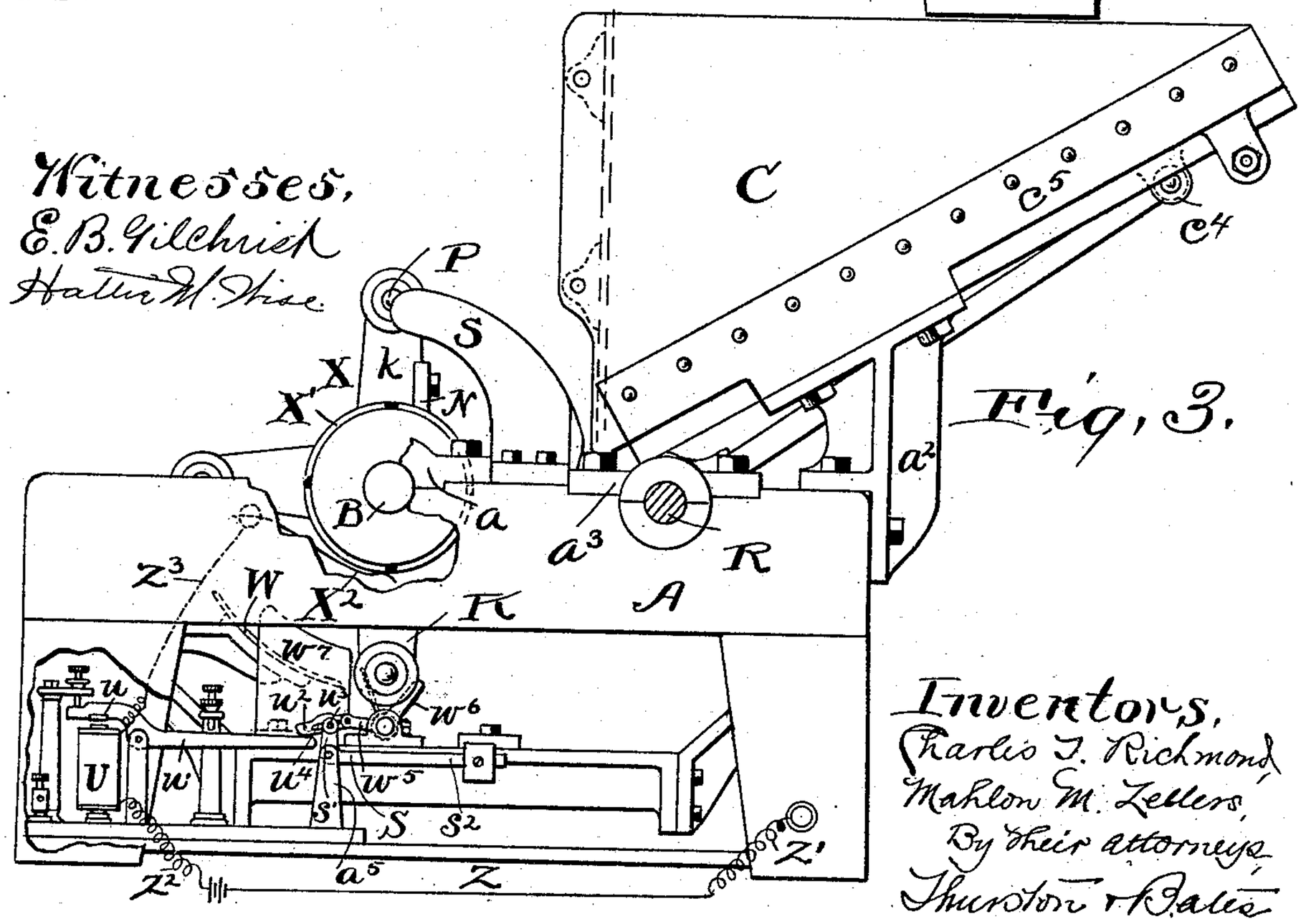


Fig. 3.



Inventors,
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UNITED STATES PATENT OFFICE.

CHARLES T. RICHMOND AND MAHLON M. ZELLERS, OF CLEVELAND, OHIO, ASSIGNORS TO THE NATIONAL CARBON COMPANY, OF SAME PLACE.

CARBON-SORTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 623,036, dated April 11, 1899.

Application filed March 26, 1898. Serial No. 675,230. (No model.)

To all whom it may concern:

Be it known that we, CHARLES T. RICHMOND and MAHLON M. ZELLERS, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Carbon-Sorting Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

Carbons for electric-arc lamps in order to be useful must be very nearly, but need not be exactly, straight. It is not possible when manufacturing carbons on a commercial scale that all of them when completed shall be straight enough to be useful. Therefore it is necessary that they shall be sorted and those too crooked separated from the others. It is believed that heretofore this sorting of the carbons has been performed generally, and so far as known always, by hand. This method has two serious disadvantages—viz., first, its cost is great, and, second, each person engaged in the work relies upon his own judgment to determine whether the carbons passing through his hands are straight enough. As a result one sorter may throw into the waste pile carbons which are straight enough, while another may put into the good pile carbons which are too crooked.

Our invention relates to a machine for sorting carbons with great rapidity, and consequently at small cost, and for performing its work with exactness, whereby all of such carbons and only such carbons as are too crooked for their intended use shall be rejected and separated from the others.

The essential features of the machine consist of a broken electric circuit, a rotary chuck connected with one terminal and adapted to grasp one end of each of the carbons to be tested and to rotate the same upon its axis, and a contact-plate connected with the other terminal and held in such relation to the carbon in the grasp of the chuck that it will be touched at some period in its rotation by every carbon which is too crooked, and by no others, thereby completing the electric circuit.

The invention consists, broadly, in the combination of the parts last above recited, and with other parts which coöperate therewith.

It also consists in the other novel combinations of parts which go to make an automatic machine, all of which are hereinafter described, and definitely pointed out in the claims.

In the drawings, Figure 1 is a plan view of a machine embodying our invention. Fig. 2 is a vertical sectional view in the plane indicated by line 2 2 of Fig. 1. Fig. 3 is a view from the right end of Fig. 1.

We will now describe the best embodiment of the invention known to us.

Referring to the parts by letters, A represents the bed of the machine, in the middle of which is a hole the purpose of which will hereinafter appear. At the ends of the bed are the boxes a a', in which is journaled a horizontal shaft B, and also the boxes a^3 a^4, in which is journaled the driving-shaft R. Motion is transmitted from shaft R to shaft B through the pinion r and gear b, fast to said shafts, respectively. A hopper C is secured upon standards a^2 a^2 at the rear of the bed. This hopper has an inclined bottom c, the middle part of which is slidable on flanges c' on the fixed parts c^5 of the bottom and is slightly raised above said fixed parts. At the bottom of the front of the hopper is a slit-like opening c^2, wide enough for the passage of one carbon only. Two arms c^3 c^3, having their front ends upturned, are secured to and project forward from the lower part of the hopper below said opening. The carbons which pass through the opening c^2 roll onto these arms, being prevented from rolling off by the upturned ends thereof. The bottom c of the hopper is caused to oscillate backward and forward by means of an eccentric r' on shaft R and an eccentric-strap r^2, whose rear end is pivotally connected with ears c^4 on the under side of the hopper-bottom. The oscillation of this bottom is so timed that it is moving backward and upward when the mechanism to be presently described is lifting a carbon from the arms c^3, wherefore the pressure of the carbons in the hopper against the carbon on said arms is relaxed, and it moves forward and downward after said carbon has been removed, whereby the weight of the carbons in the hopper is al-

lowed to act with full force to push the lower carbon out onto said arms.

Secured to the shaft B are three spiders F H K, each having as many substantially radial arms *f h k* as desired—in the present case four. The arms of the several spiders are arranged in groups of three, one from each spider, substantially as shown, all of the arms of each group lying in the same substantially radial plane. Each group of arms furnishes the support for one group of mechanism—viz., a rotating chuck M, adapted to grasp a carbon by one end and rotate it upon its axis, a contact-plate T, and mechanism for lifting the carbon from the arms c^3 c^3 and forcing it into and subsequently ejecting it from the chuck. Each group of mechanism is like although independent of the other groups, wherefore a description of one will do for all. It will be understood that, as before stated, there may be as many of such groups of supporting spider-arms as desired.

Rotatably mounted in the spider-arms *f* and *h* is a chuck-shaft J, having secured to its outer end a pinion *j*, which meshes with a fixed gear *j'*, which is concentric with the shaft B. On the inner end of this shaft is the chuck M. Any suitable chuck may be employed provided suitable mechanism is supplied for opening and closing the same at the proper time. It is believed that a particular description of this chuck will be unnecessary, and that it will be sufficient to say that it is closed by the forward movement of an external sleeve *m*—that is, toward the top, as shown in Fig. 1—and that the sleeve is so moved by contained springs m^5, and that it is opened by the movement of said sleeve in the contrary direction. This latter movement is produced by means of a forked lever *m'*, pivoted to any suitable support which maintains a fixed relation to the chuck-shaft—as, for example, to a bar N, which is primarily used for the purpose to be presently described. A rod m^2, which is slidably mounted in the two spider-arms *f* and *h*, is connected with one arm of this lever, and the other or forked end of the lever engages in a groove m^3 in the chuck-sleeve. The other end of the sliding rod m^2 is adapted to be engaged by fixed cams O O', and are formed and arranged so as to engage with and move the rod m^2, and consequently to open the chuck when said chuck arrives at the position in which a carbon should be introduced into its grasp and also when the mechanism reaches a position where the carbon should be ejected from said chuck.

In the spider-arm *k* is mounted a sliding rod P in axial line with the chuck-shaft. It is moved outward—that is to say, to the top as shown in Fig. 1—by a spring *p*, and it is moved inward or toward the chuck by its engagement with a fixed cam S, secured to the bed A. On the inner end of this rod is a spring-foot *p'*, whose spring p^2 acts to force the foot toward the chuck until stopped by the pin p^3 in slot p^4. Secured to the bar N, which extends between and is fastened to the spider-arms *h* and *k*, are two hook-shaped arms Q Q, which as the spiders are revolved by the shaft B come up under a carbon resting on the arms c^3 c^3, and lift it from them, the carbon being then supported on said arms Q Q, but about in axial line with the chuck. At or just before this time the chuck-jaws are opened, and then the rod P is moved inward by the cam S referred to, its spring-foot engages with the end of the carbon, and the carbon is forced endwise into the open jaws of the chuck to a seat or shoulder m^6 therein, the spring-foot yielding when this engagement between the other end of the carbon and said shoulder is effected. The rod m^2 then passes off the cam O, whereupon the chuck-jaws are immediately closed, and thereafter and until the carbon is ejected it is rotated upon its axis by the rotation of the chuck. The bar N is used as a convenient means for supporting the contact-plate T. On what may be called the "back" side of this contact-plate are ears *t*, which are grasped by jaws n' n^2, the jaws being closed by screws n^3, whereby the contact-plate T may be placed and held at the desired distance from and in substantially parallel relation to an exactly straight carbon in the grasp of the chuck. One jaw n' of each pair is bolted to the bar N, while the other jaw n^2 is moved toward it by the screw n^3. The distance of the contact-plate may, as stated, be adjusted; but it will usually be about a sixteenth of an inch, more or less, from a straight carbon, wherefore any carbon which is curved out of a straight line as much as a sixteenth of an inch will, as it is revolved by the chuck, be brought into contact with this contact-plate. The contact-plate is insulated from the machine, but it is electrically connected with one terminal of an electric circuit. The machine itself, and consequently the chuck, is connected with the other terminal of said circuit. The contact of one of the carbons in the grasp of the chuck with this contact-plate closes the circuit.

The closing of the circuit by a crooked carbon may be utilized in various ways in separating the crooked from the straight carbons. For example, some signaling device connected in the circuit might apprise the operator of the machine that a crooked carbon was in its grasp, whereupon the operator might take any appropriate steps to separate this carbon from the others. For example, he might stop the machine and remove it. The electromagnet U may be taken as a type of such signaling device, for by attracting its armature *u* it might produce a click which could be heard by the operator, or any other signaling device might be substituted for that shown.

While a machine in which the completion of the circuit by a crooked carbon merely operated a signal to attract the operator's attention would perform the work of sorting the straight and crooked carbons much more ac-

curately than the most skilled workman could, and perhaps might do this work more cheaply, it is clear that such a machine is inefficient in comparison with the machine in its completeness, as shown, for in said machine the closing of the circuit and the energizing of the magnet instead of merely operating a signal cause the operation of a switch, by means of which the crooked carbon which closed the circuit will, when ejected from the chuck, be guided away from the pile or receptacle for the straight carbons.

Secured below the opening in the bed before referred to is an inclined floor W, upon which the carbons fall as they are ejected from the chuck. This floor is preferably made of sheet metal. Below the end of this floor are the two reversely-inclined floors w and w', and at the meeting of these floors a switch-gate w^2 is placed. When this gate is closed, it bridges the opening between the floors W and w', as indicated by dotted lines in Fig. 2, wherefore a carbon dropped onto floor w is delivered onto floor w'. When this gate is open, it forms a barrier between floors W and w' and causes the carbons to drop off floor W onto floor w, whence they roll onto the pile of good carbons. The carbons on floor w' roll onto the pile of crooked carbons. This gate is rigidly attached to a rock-shaft w^4, upon one end of which is secured an arm w^5. The armature u of the magnet U is attached to a pivoted lever u', the rear end of which lies beneath one arm of a pivoted lever u^2, whose other arm is pivoted to the rock-shaft arm w^5, before referred to. This lever u^2 is pivoted to its support (which, as shown, is the vertical arms s' of a bell-crank lever S, which is pivoted to the standard a^5, the horizontal arm s^2 of said lever being weighted, as shown) by means of a pin u^3, which passes through a slot u^4 in said lever. When the gate is open, in which position it is intended to be normally held, the pivot or joint of the toggle formed by the lever u^2 and the arm w^5 on the said rock-shaft has passed above the center, and the weight of the gate acts to prevent the return of this joint over the center, until which time the gate cannot close. When, however, the electric circuit is closed and the magnet attracts its armature, the armature-lever u' pushes the end of lever u^2 upward, which draws the joint over the center, and then the weight of the gate effects its own closing It remains closed long enough for the carbon to pass over it and then a projection (which may be the rod P) strikes an arm w^6 on the rock-shaft, causing the rock-shaft to oscillate and move the toggle-joint below the center, whereby the switch-gate and its operating mechanism are returned to their normal position, as described, the electric circuit having in the meantime been broken again.

The means for ejecting the carbons from the chuck consists of an ejector-rod m^6, movable longitudinally through the chuck-shaft and adapted to abut against the end of the carbon in the chuck, and an arc-shaped spring Y, secured to the frame of the machine and extending into the path of the projecting end of this ejector-rod. As the ejector-rod is carried around by the revolution of the shaft B this spring is more and more deflected out of its normal position. When the chuck is opened by the cam O', this spring immediately reacts, pushing the ejector-rod inward, with the result of suddenly kicking the carbon out of the chuck, its far end striking against a vertical plate w^7, whereupon it falls upon the inclined floor W, before referred to.

As before stated, the mechanism just described is that which is associated with one group of spider-arms. There are consequently four groups of such mechanism. A commutator X, whose surface is divided into four sections X', is secured to the shaft B. A brush X^2, connected in the circuit, bears upon the face of the commutator. Each commutator-section is connected electrically by the wire X^3 with one of the contact-plates T referred to.

The generator of current is indicated conventionally at Z. The wire Z' is connected with the machine, and the wire Z^2 with one end of the magnet-coil. The wire Z^3 connects the other end of said coil with the brush.

Having described our invention, we claim—

1. In a carbon-sorting machine, the combination of a rotating chuck for holding a carbon, which chuck is connected with one terminal of an electric circuit, and a contact-plate arranged substantially as described with relation to a carbon in the grasp of said chuck, said plate being connected with the other terminal of said circuit, substantially as specified.

2. In a carbon-sorting machine, the combination of a rotating chuck for holding a carbon, which chuck is connected with one terminal of an electric circuit, and a contact-plate in the described relation to a carbon in the grasp of said chuck, said plate being connected with the other terminal of said chuck, and means for adjusting the position of said plate relative to the axis of the chuck, substantially as specified.

3. A rotating shaft, a rotary chuck-shaft mounted in bearings carried thereby, a chuck on the end of said chuck-shaft, means for opening and closing said chuck, a device for supporting a carbon in line with the chuck, a push-rod for moving the carbon endwise into the grasp of the chuck, a contact-plate arranged substantially as described with respect to a carbon in the grasp of said chuck, electrical connections between one terminal of an electric circuit and said contact-plate and between the other terminal and a carbon in the grasp of said chuck, substantially as specified.

4. In a carbon-sorting machine, the combination of a rotating chuck for holding a carbon, which chuck is connected with one terminal of an electric circuit, and a contact-plate arranged substantially as described with

relation to a carbon in the grasp of said chuck, said plate being connected with the other terminal of said circuit, with means for ejecting the carbon from said chuck, an electromagnet connected in said circuit, and a switch-gate adapted to be operated by said magnet, which guides the carbon in one direction or another after it has been ejected from the chuck, substantially as specified.

5. In a carbon-sorting machine, the combination of a rotating chuck for holding a carbon, which chuck is connected with one terminal of an electric circuit, and a contact-plate arranged substantially as described with relation to a carbon in the grasp of said chuck, said plate being connected with the other terminal of said circuit, a hopper having an inclined bottom and a slit-like opening for the passage of carbons singly from said hopper, arms below said opening onto which said carbons roll as they pass through said opening, means for lifting the carbons from said arms, and a device for moving them endwise into the grasp of the chuck, substantially as specified.

6. In a carbon-sorting machine, the combination of a rotating shaft, a group of arms secured thereto, a chuck-shaft rotatably mounted in said arms, a chuck carried thereby, means for opening and closing the chuck-jaws, and a pair of carbon-supporting arms, a hopper adapted to discharge carbons singly onto said arms, lifting-arms carried by the rotating shaft and adapted to lift the carbon off said carbon-supporting arms, and a device for moving the carbons endwise into the grasp of the chuck, an electric circuit connected at one terminal with said chuck, and a contact-plate connected with the other terminal, substantially as specified.

7. In a carbon-sorting machine, the combination of a rotating shaft, a group of arms secured thereto, a chuck-shaft rotatably mounted in said arms, a chuck carried thereby, means for opening and closing the chuck-jaws, and a pair of carbon-supporting arms, a hopper adapted to discharge carbons singly onto said arms, lifting-arms carried by the rotating shaft and adapted to lift the carbon off said carbon-supporting arms, and a device for moving the carbons endwise into the grasp of the chuck, an electric circuit connected at one terminal with said chuck, a contact-plate connected at the other terminal, an electromagnet connected in said circuit, a device for ejecting carbons from said chuck, an inclined floor upon which the carbons fall, and a movable switch-gate adapted to be operated by said electromagnet, substantially as specified.

8. In a carbon-sorting machine, the combination of a rotating chuck for holding a carbon, which chuck is connected with one terminal of an electric circuit, and a contact-plate arranged substantially as described with relation to a carbon in the grasp of said chuck, said plate being connected with the other terminal of said circuit, with means for ejecting the carbon from said chuck, an inclined floor upon which the carbon so ejected will fall, a rock-shaft having a gate secured thereto, and an electromagnet, connected in said circuit, for operating said rock-shaft, substantially as specified.

9. In a carbon-sorting machine, the combination of a rotating shaft, a group of arms secured thereto, a chuck-shaft rotatably mounted in said arms, a chuck carried thereby, means for opening and closing the chuck-jaws, and a pair of carbon-supporting arms, a hopper adapted to discharge carbons singly onto said arms, lifting-arms carried by the rotating shaft and adapted to lift the carbon off said carbon-supporting arms, and a device for moving the carbons endwise into the grasp of the chuck, an electric circuit connected at one terminal with said chuck, a contact-plate connected at the other terminal, an electromagnet connected in said circuit, a device for ejecting carbons from said chuck, an inclined floor upon which the carbons fall, a movable switch-gate, a rock-shaft to which said gate is secured, an arm secured to said rock-shaft, a lever u^2, an armature-lever u', an arm secured to the rock-shaft, and a device carried by the rotating shaft for engaging with the last-named arm, substantially as specified.

10. In a carbon-sorting machine, the combination of a rotary chuck, means for opening and closing the same, arms for supporting a carbon in axial line with the chuck, an endwise-movable rod P having a spring-foot, and mechanism which moves said rod endwise to cause it to force a carbon on said arms into the chuck, substantially as specified.

11. In a carbon-sorting machine, the combination of a rotating shaft, a group of arms secured thereto, a chuck-shaft rotatably mounted in some of said arms, a chuck secured to said shaft, a sliding sleeve for opening and closing said chuck, springs for moving said sleeve in one direction, the fork-lever for moving it in the opposite direction, an endwise-movable rod, a fixed cam with which said rod engages, a pair of arms for supporting a carbon, a push-rod, and a fixed cam and spring for operating said push-rod, substantially as specified.

12. In a carbon-sorting machine, the combination of a shaft, arms secured thereto, a rotary chuck-shaft mounted in said arms, a chuck secured upon said shaft, means for opening and closing said chuck, an ejector-rod movable endwise through said chuck-shaft, and the arc-shaped spring which projects into the path of said ejector-rod, substantially as specified.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

CHARLES T. RICHMOND.
MAHLON M. ZELLERS.

Witnesses:
E. H. WHITLOCK,
H. E. HACKENBERG.