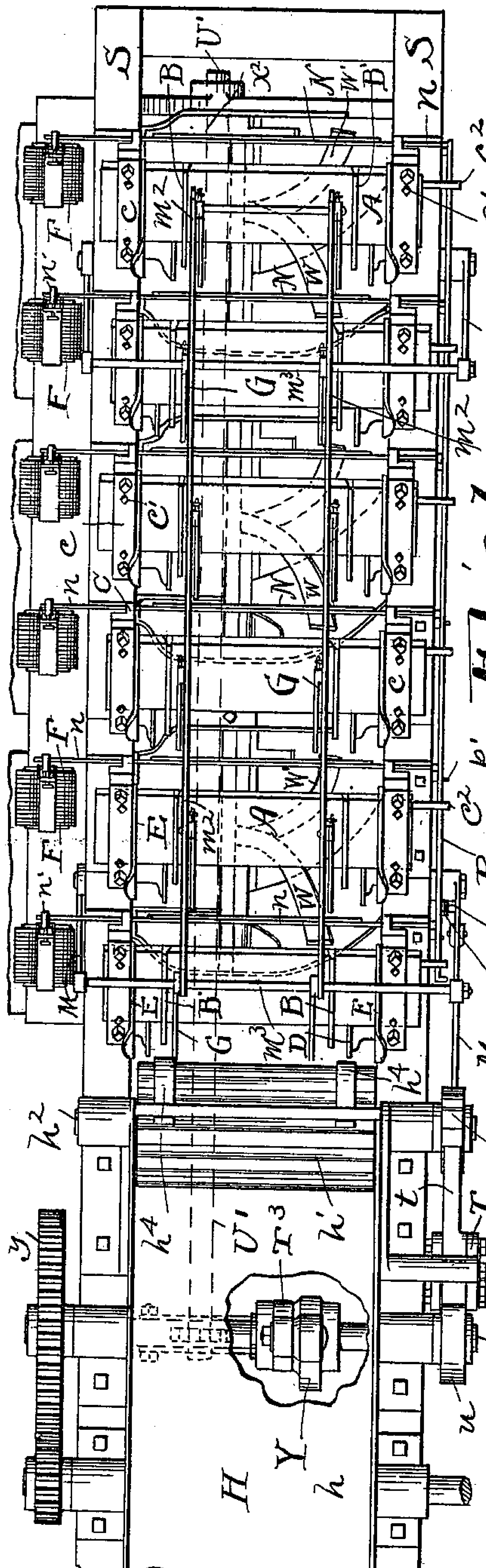
No. 672,201. Patented Apr. 16, 1901.

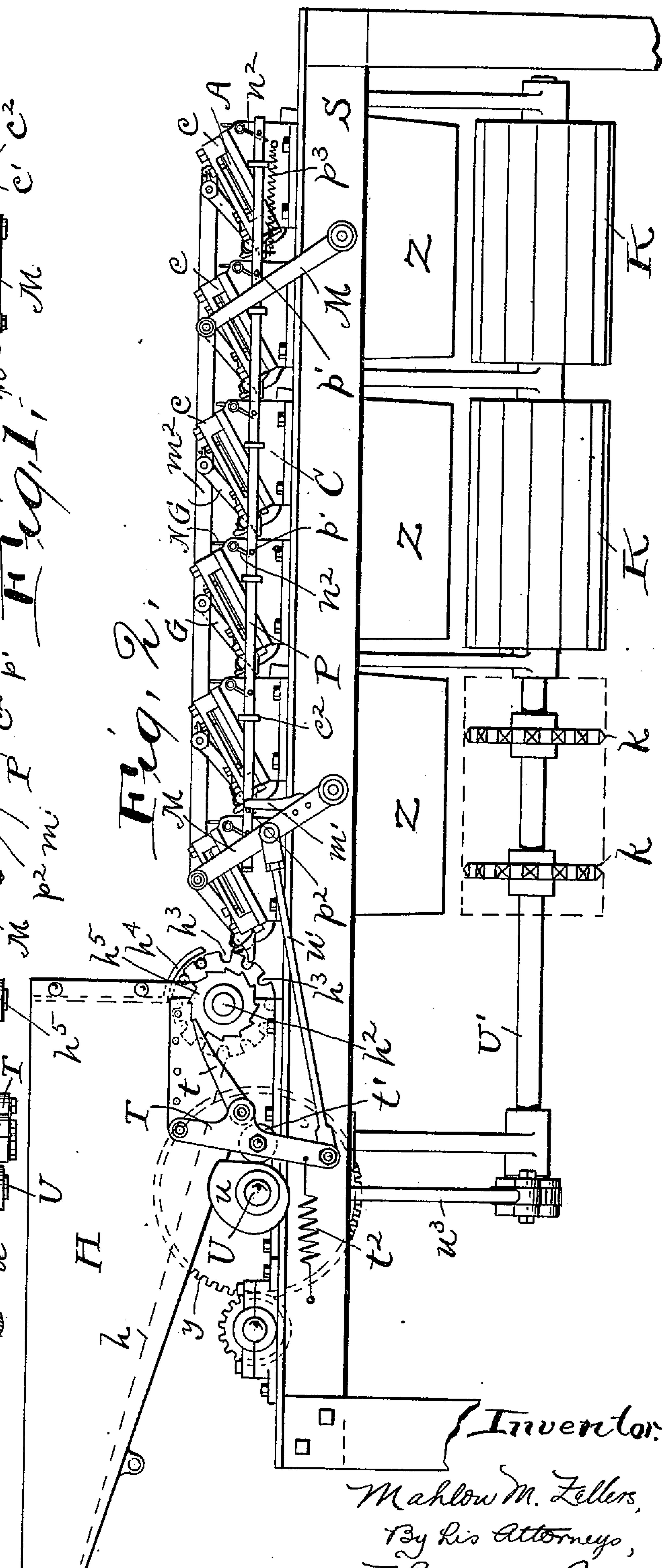
M. M. ZELLERS.

CARBON SORTING MACHINE.

(Application filed Sept. 5, 1899.)

(No Model.) 4 Sheets—Sheet 1.





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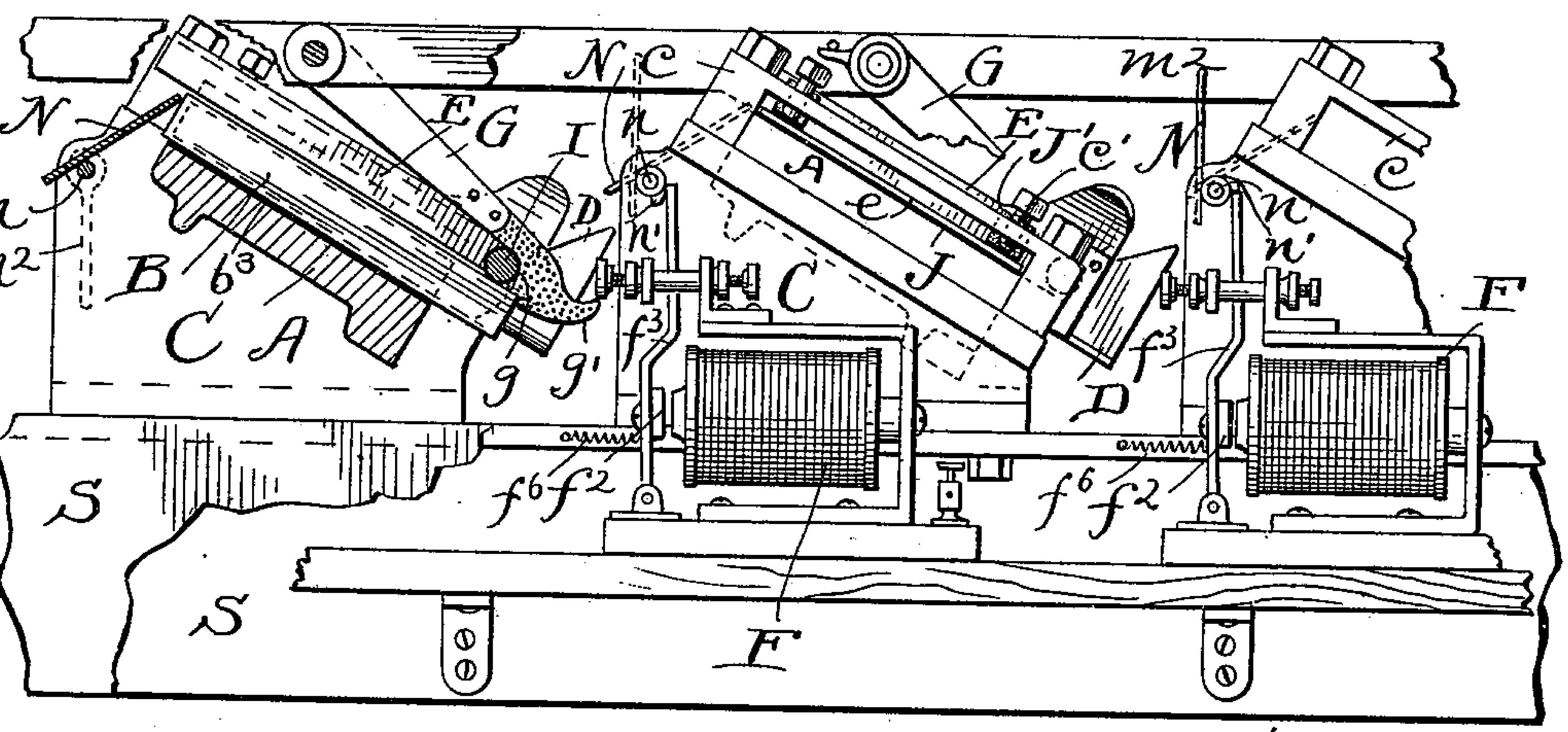


Fig. 3.

Fig. 4.

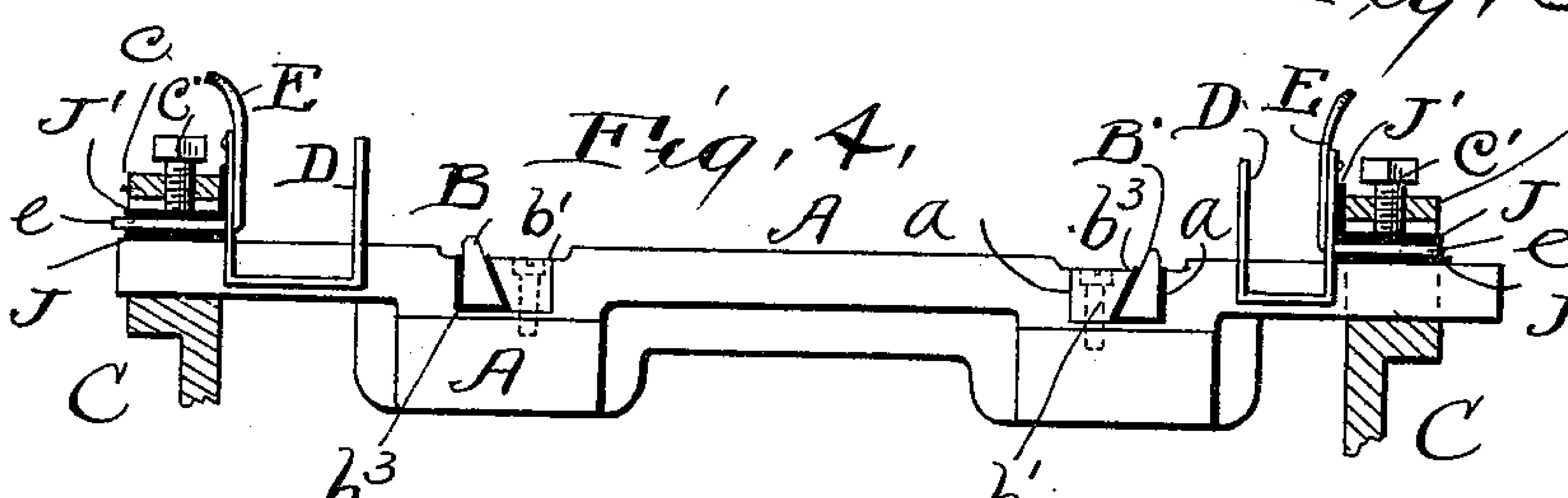


Fig. 5.

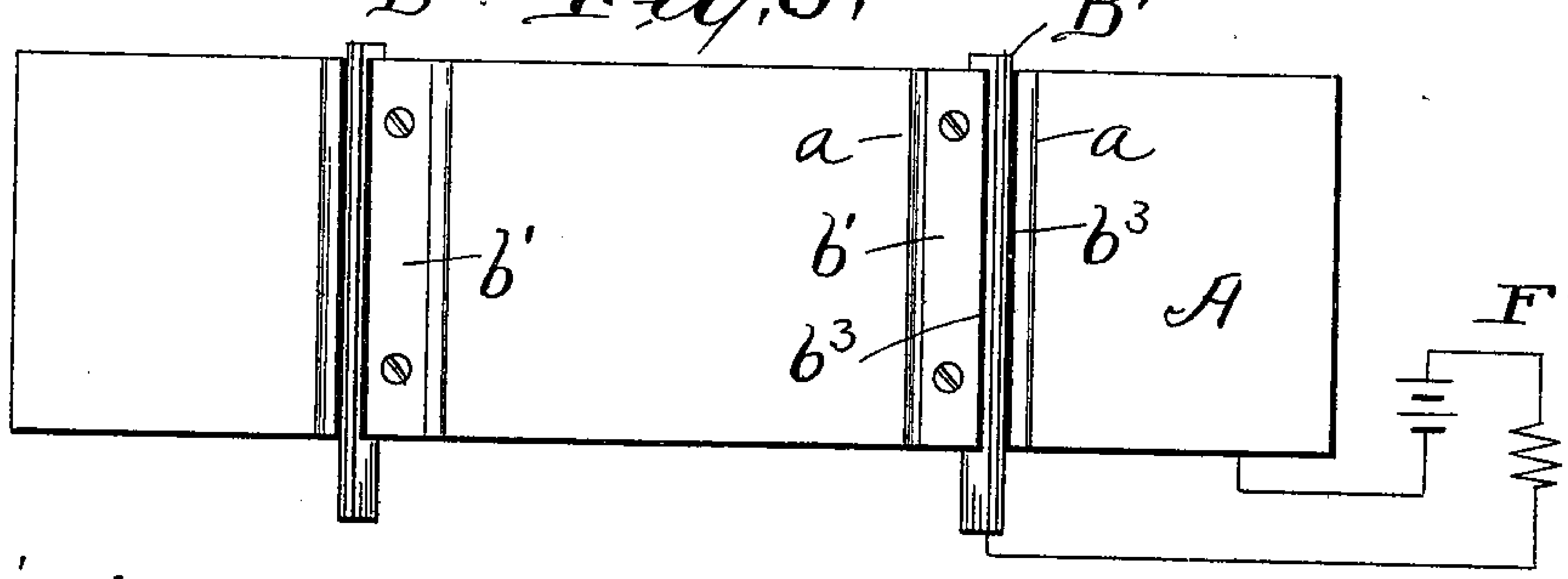


Fig. 7.

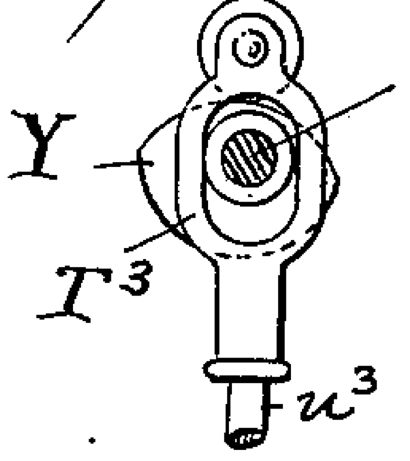
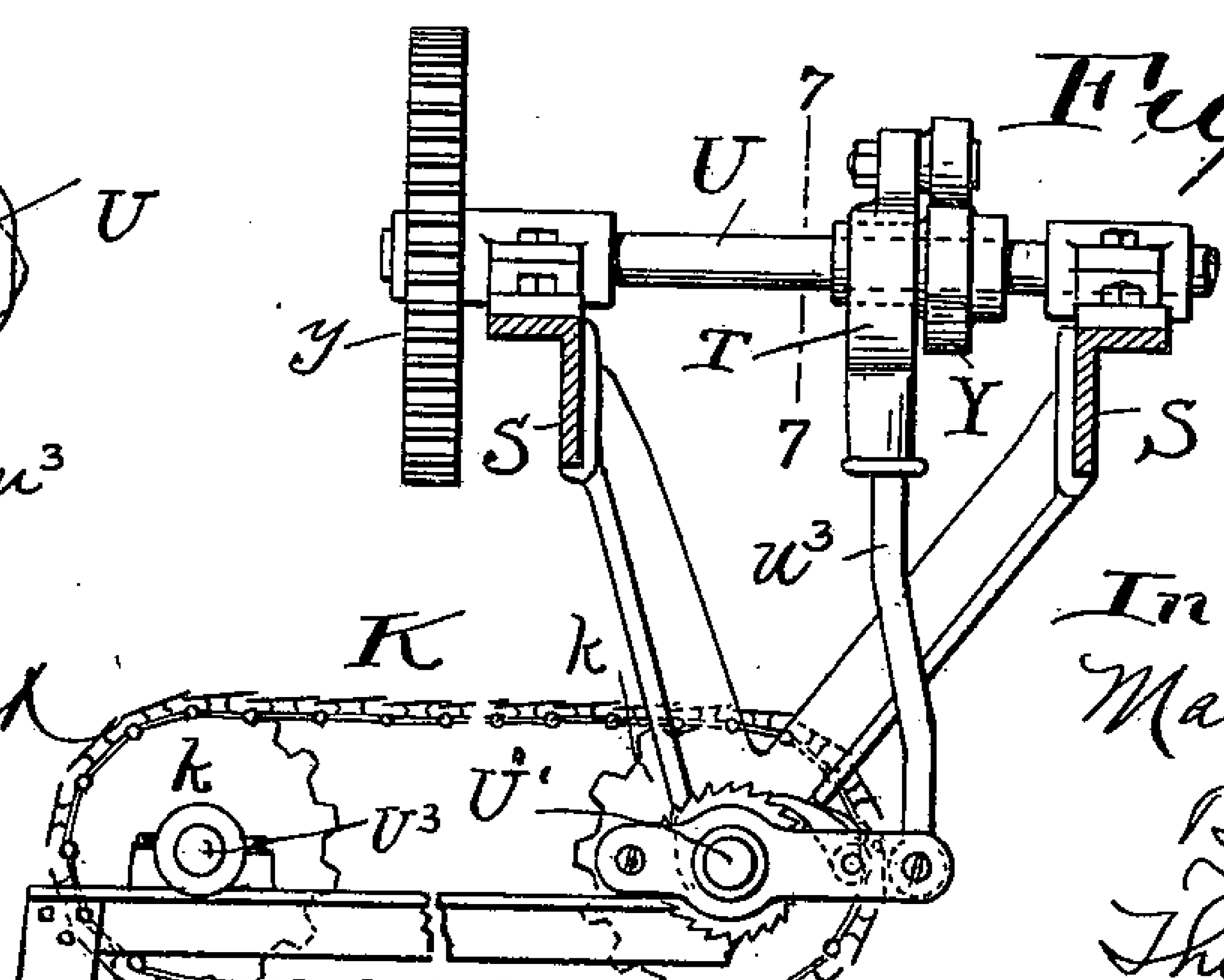


Fig. 6.



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4 Sheets—Sheet 3.

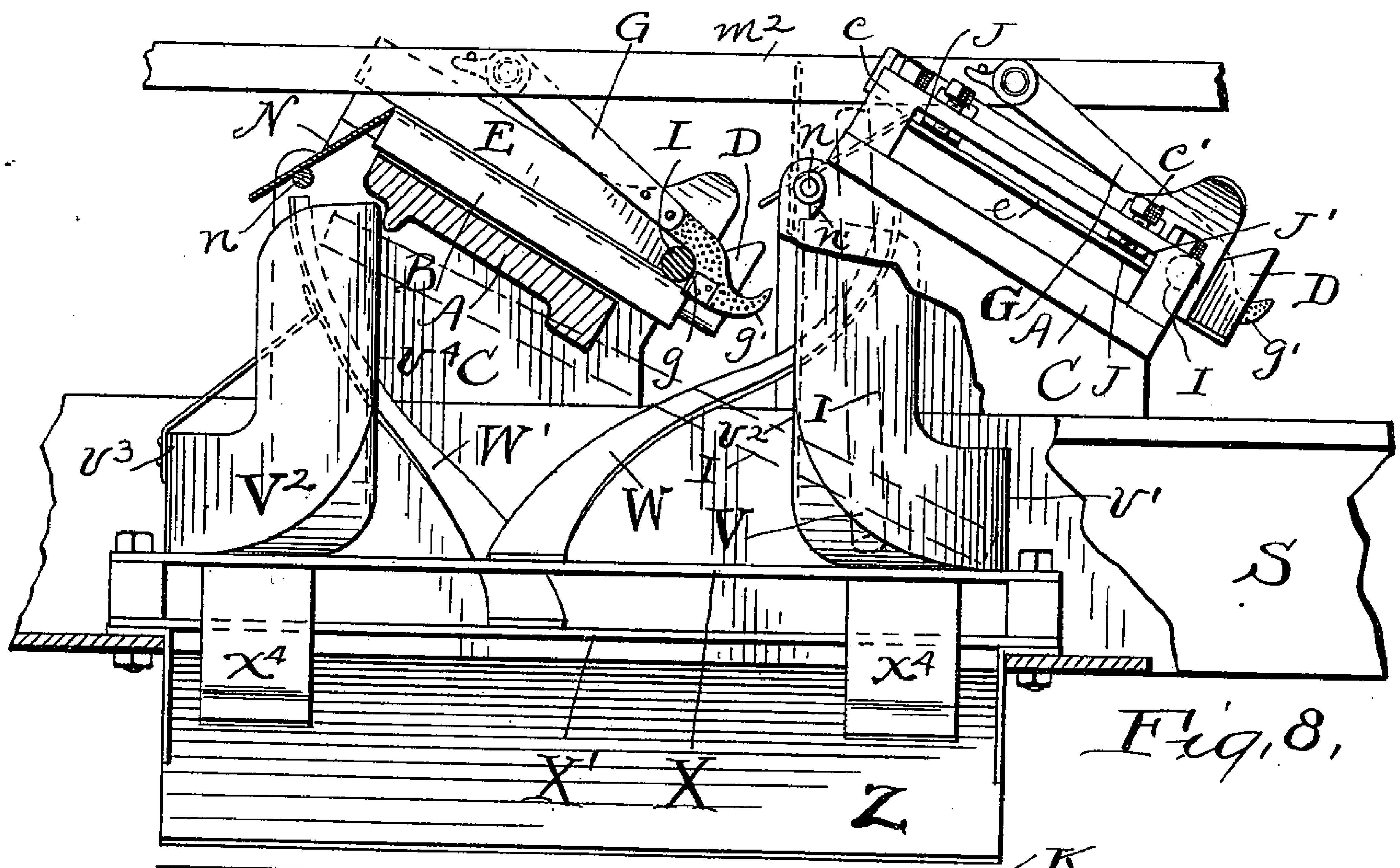

Fig. 8.

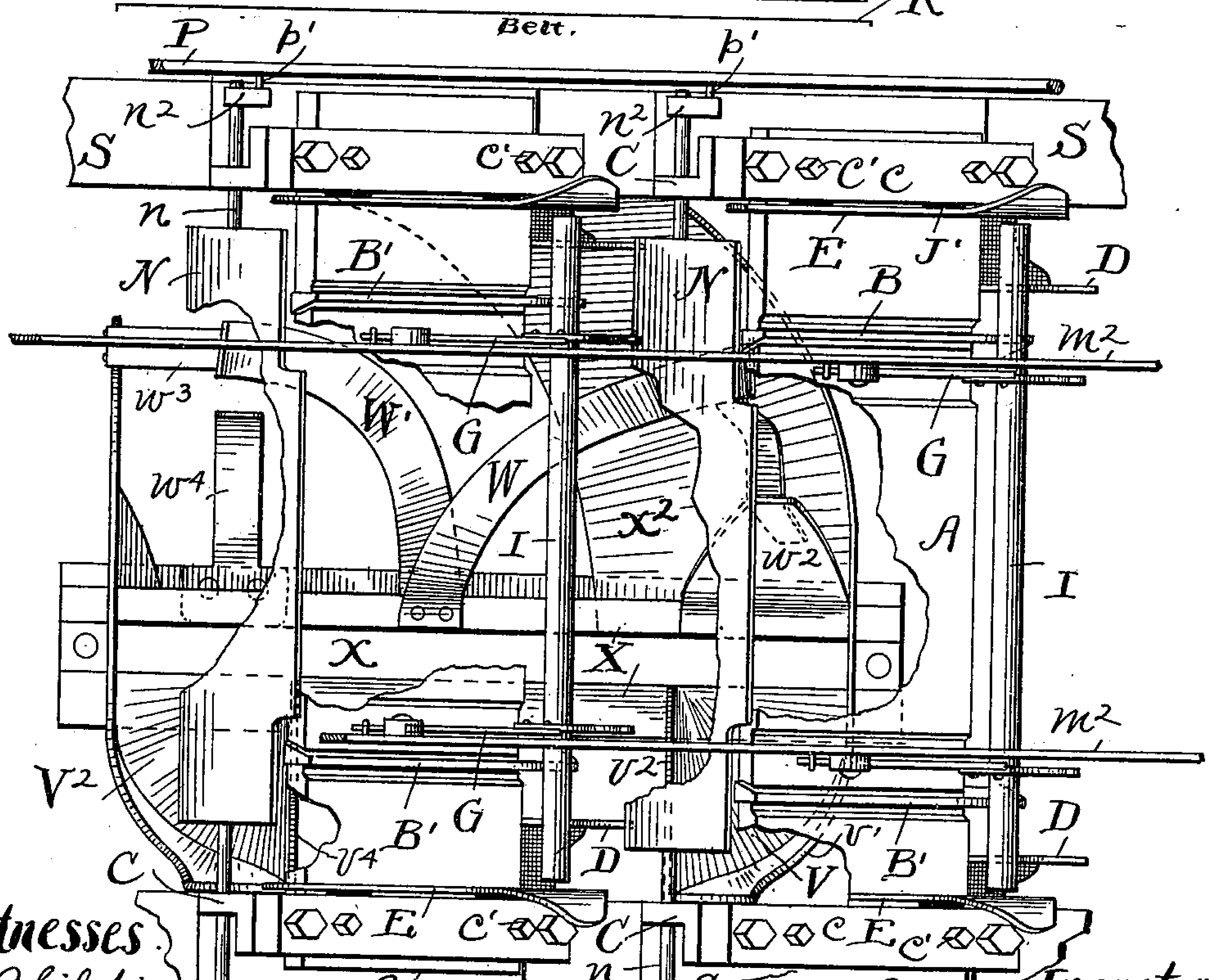

Fig. 9.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 10,

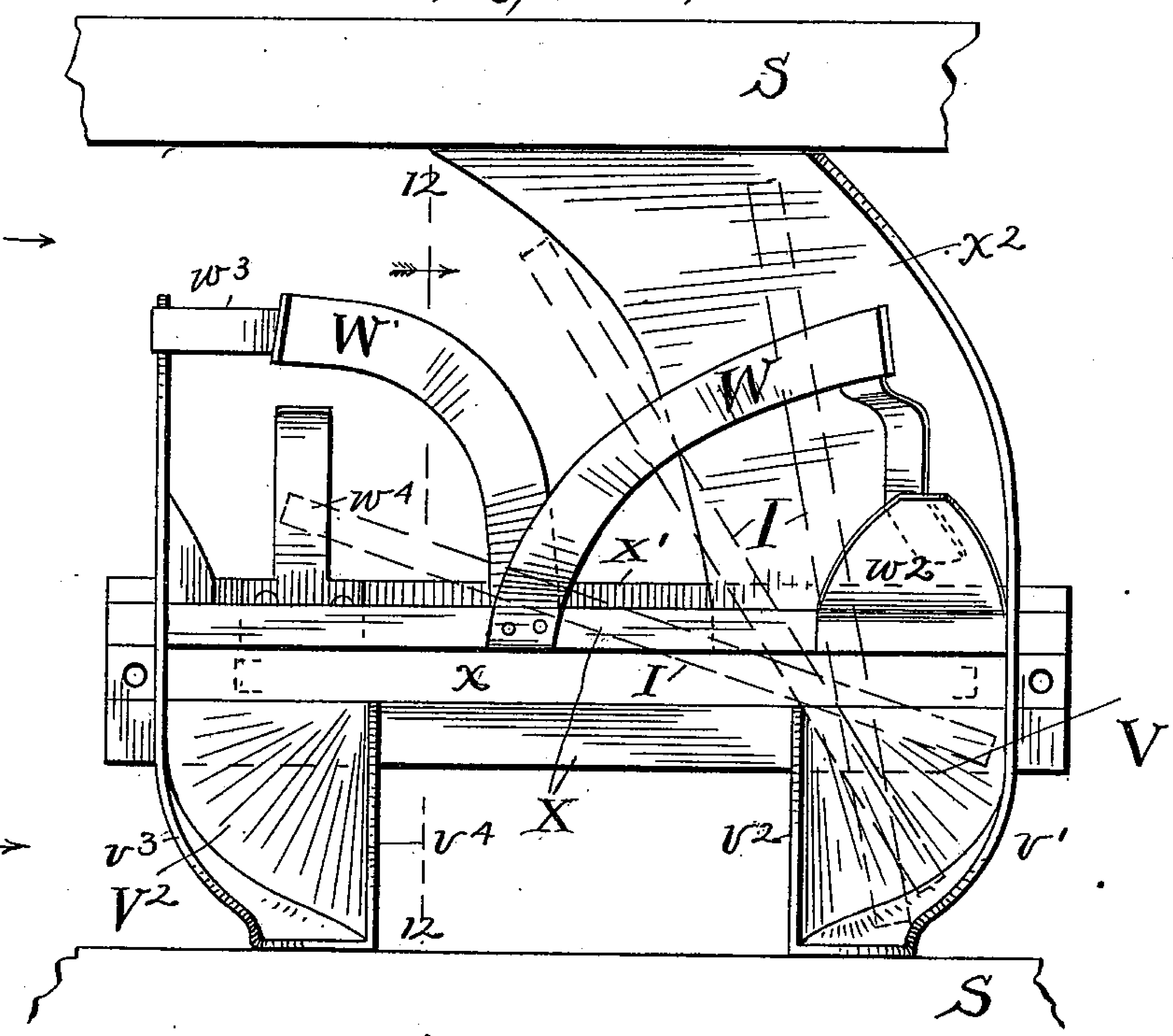
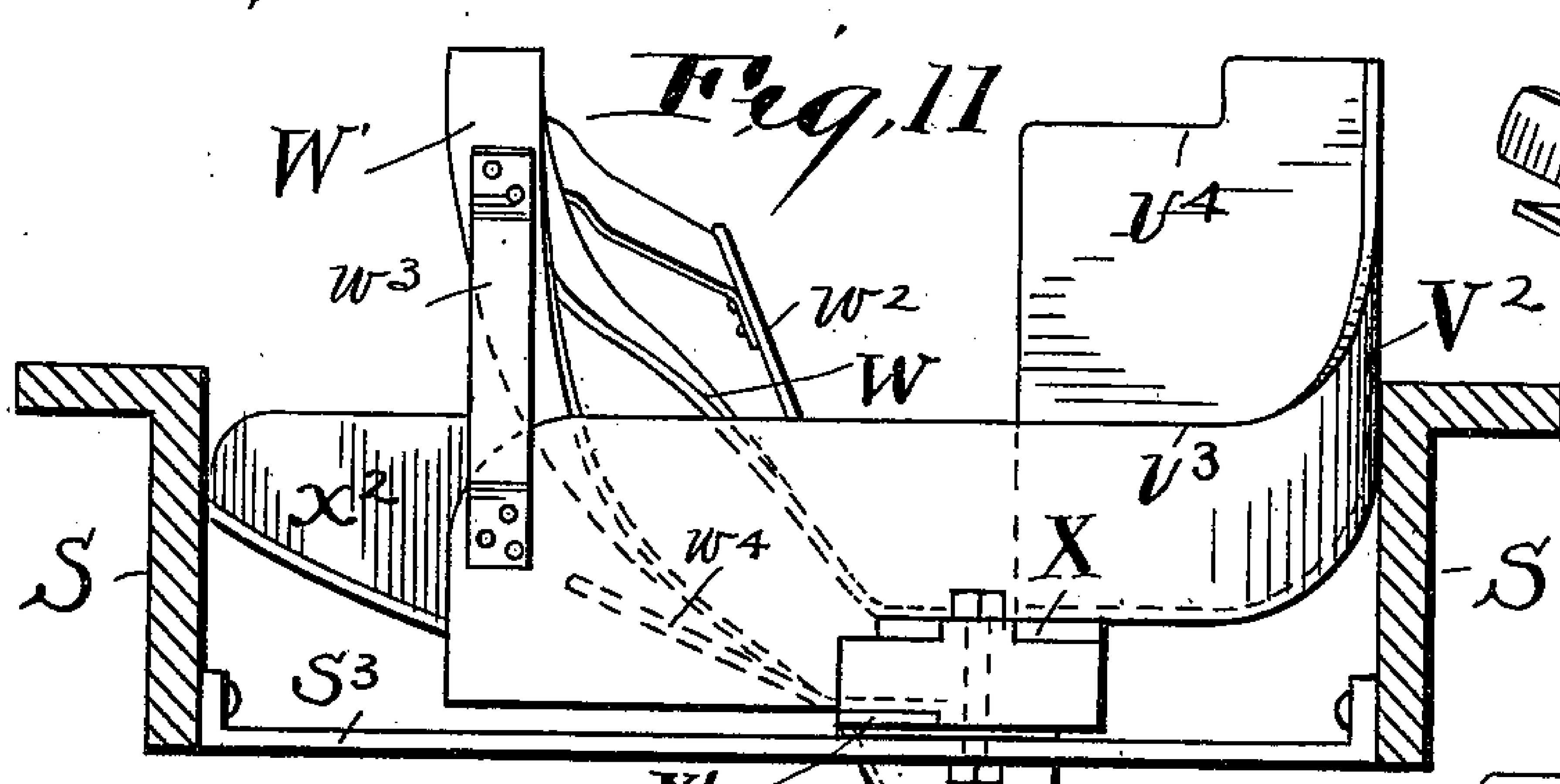


Fig. 11



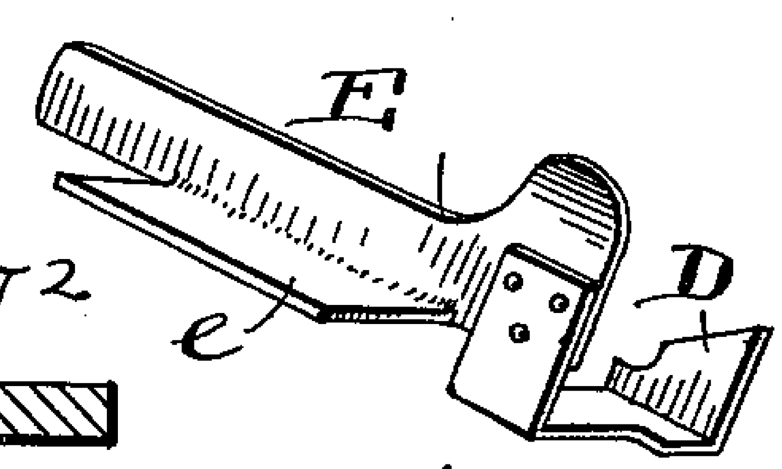
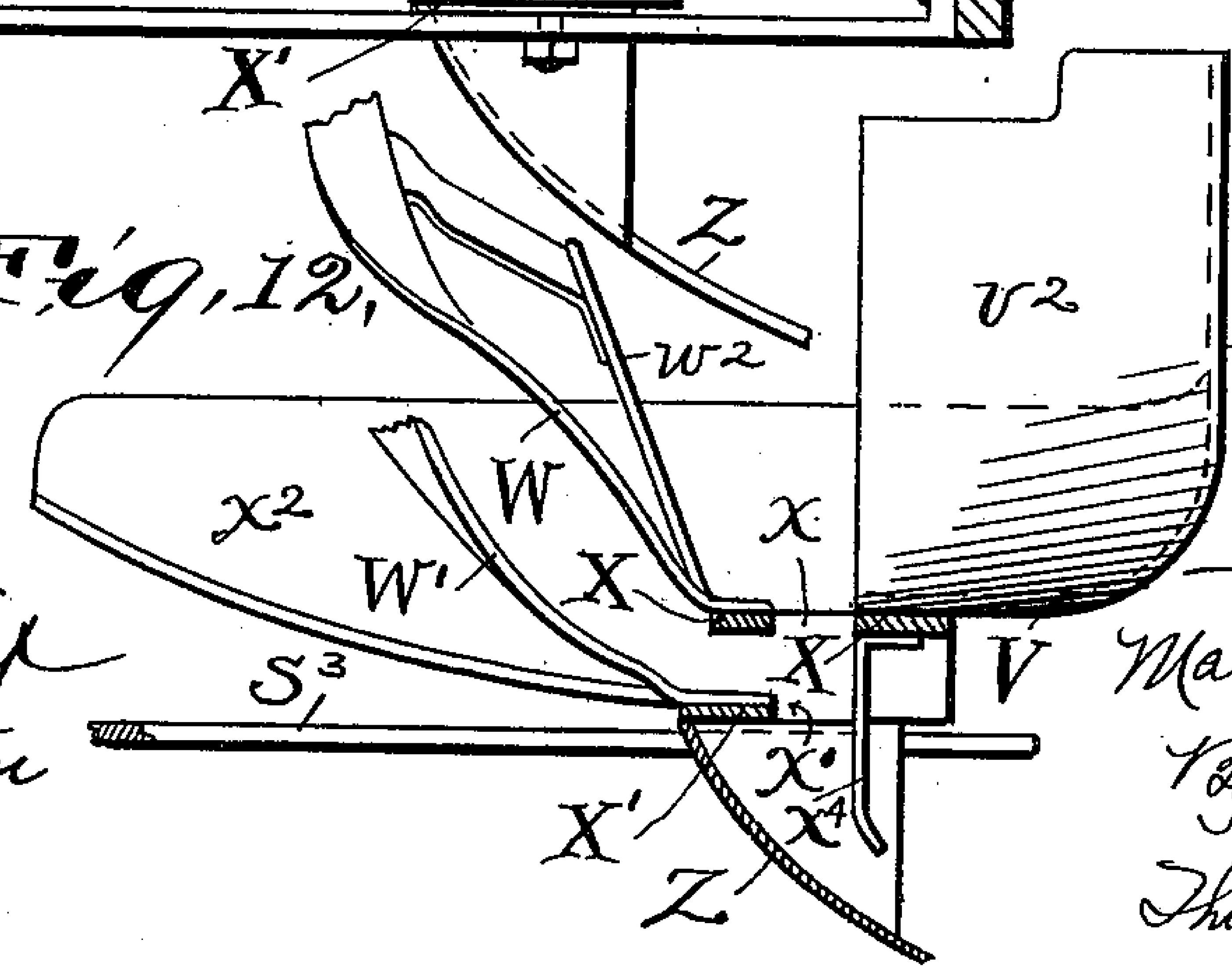


Fig. 13.

Fig. 12.



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UNITED STATES PATENT OFFICE.

MAHLON M. ZELLERS, OF CLEVELAND, OHIO, ASSIGNOR TO THE NATIONAL CARBON COMPANY, OF TRENTON, NEW JERSEY.

CARBON-SORTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 672,201, dated April 16, 1901.

Application filed September 5, 1899. Serial No. 729,515. (No model.)

To all whom it may concern:

Be it known that I, MAHLON M. ZELLERS, a citizen 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.

In the manufacture of electric-light carbons it is practically impossible to make them all straight, and it is therefore necessary that those which are too much bent or too crooked be separated from those which are straight enough for use. In most cases it is also necessary to grade the useful remainder according to their crookedness. Heretofore this work has generally been done by hand, which is objectionable because it is expensive and also for the reason that all of the men employed for the purpose are not equally skilful nor are they all able to adopt and work to the same standards.

The object of my invention, which is embodied in the machine shown in the drawings, is to mechanically sort electric-light carbons and to separate those which are too crooked for use from those which are not and to accurately grade the useful remainder according to the definite standards.

The invention consists in the construction and combination of parts shown in the drawings and hereinafter described and claimed.

In the drawings, Figure 1 is a plan view of the machine. Fig. 2 is a side elevation. Fig. 3 is an enlarged side elevation, partly in section, from the opposite side of the machine. Fig. 4 is a front view of the contact-plate and parts attached thereto. Fig. 5 is a plan view of the same. Fig. 6 is a view of one of the transversely-movable carrier-belts K and its operating mechanism. Fig. 7 is a sectional view on line 7 7 of Fig. 6. Fig. 8 is a side elevation, partly in section, showing a pair of testing devices and their associated turning devices. Fig. 9 is a plan view of the same mechanism, some of which is broken away. Fig. 10 is a plan view of the turning devices alone. Fig. 11 is a view of the same looking in the direction of the arrow. Fig. 12 is a sectional view on line 12 12 of Fig. 10 looking in the same direction; and Fig. 13 is a perspective view of one of the guide-plates E and receiving-arms D.

The machine shown in the drawings is designed to separate the carbons into three grades; but this is arbitrary. It might be organized to separate them into a less or greater number of grades, as desired. For separating each grade two testing devices are provided in the machine as organized, one to determine whether one end of each carbon is straight enough and one to test the other end of those carbons which are too crooked at the end first tested. All of these testing devices are alike in construction and mode of operation and differ only in the adjustment and relation of the parts. A description of one of the testing devices will therefore answer for all.

The construction is as follows: A metallic contact-plate A is supported near its ends by two standards C. It is inclined from its front end upward in order to better coöperate with the mechanism shown, which rolls the carbons along tracks B B′, secured to this plate. The tracks B B′ are of metal, but they are insulated from the contact-plate. In the particular construction shown two parallel grooves *a* are formed in the contact-plate. Each track has one beveled side, and it is surrounded by insulating material b^3, except upon its projecting top edge. The beveled side thereof is adjacent to the beveled face of a gib b', which contacts with the interposed insulating material b^3 and is fastened in the grooves by screws, whereby the track is held firmly in place. The tracks are parallel with each other, and they extend lengthwise of the machine. Their top edges are slightly above the plane of the top surface of the contact-plate. These tracks are connected with one pole of an electrical circuit in which an electromagnet F is connected. The other pole of said circuit is connected with the contact-plate A. The carbons I are delivered onto these tracks and are rolled along upon the same. If they are so bent or crooked that one overhanging end or the other or the middle part between the tracks touches the contact-plate A, the electrical circuit is completed and the magnet F attracts its armature f^2, with results which will be presently explained. If the tracks are elevated above the contact-plate A only a very short distance, a slight crook in the carbon will make the described contact and consequent electrical connection, and the more said tracks are raised above said plate the more must a carbon be bent in order that it shall make this connection.

In the first two sorting devices—that is to say, the two which are nearest the hopper H—the tracks are only slightly above the contact-plate. Therefore only the straightest carbons will pass over either of these devices without making contact and completing the circuit. It might be here stated that it is necessary that that end of the electric-light carbon which goes onto the holder in the lamp ought to be pretty straight, but that a little crookedness at the other end does not so much matter. The sorting devices to be presently explained are arranged to test the carbons to find those which have one comparatively straight end—straight enough to stand the test to which they are subjected—although the other end may not be quite so straight.

Returning now to a description of the testing device, it will be noticed that two receiving-arms D are located in front of the contact-plate A, from which, however, they must be insulated. As shown, they are connected with the insulated guide-plates E. Their ends are extended to such positions that the carbons will be delivered upon them, and their top faces are inclined downward and rearward in such a manner that said carbons will roll down said arms onto the tracks. Near each side of each contact-plate is a vertical guide-plate E, which extends lengthwise of the machine. These plates are adjusted in accordance with the lengths of the carbons being tested, so as to lie close to the ends of said carbons and may contact with them, and they serve to prevent endwise movement of the carbons. These guide-plates are secured upon the contact-plate A; but they are insulated from said contact-plates and from any other part of the machine. In the specific construction shown each contact-plate A rests upon standards C and lies beneath the yoke-bars c, which are secured to these standards. The contact-plates may be shifted sidewise upon these standards and may be clamped in any desired position by screws c'. The guide-plates E have feet e, which pass under these yoke-bars, and they rest upon a piece of insulated material J upon the contact-plate. Another piece of insulating material J′ is interposed between the guide-plates and the yoke-bars. The screws c', which clamp the contact-plates down upon the standards, also clamp the guide-plates down upon the contact-plates bearing upon said insulating-strip J′.

The described specific construction is convenient and inexpensive as the means for effecting the desired result—namely, the lateral adjustment of the contact-plate A, the securing of it and the guide-plates in fixed position, and the complete insulation of the guide-plates E and arms D from the contact-plate. Any other means for effecting these results, however, may be substituted.

After a carbon has been delivered onto the tracks B B it is rolled upon the same by the hooked arms G. There are two of such arms associated with each sorting device. These hook-arms are loosely pivoted at their upper ends to a support which has a reciprocating movement lengthwise of the machine. The front ends g' of said arms G—that is to say, the ends in which the hooks are formed—are made of insulating material and have the hooks g back from their upturned ends g'. The free front ends of said arms rest upon the top surface of the contact-plate A. When these hook-arms are moved forward, (toward the hopper,) their free ends when they reach the carbons (which are then resting upon the tracks and against said receiving-arms D) ride over said carbons and fall down in front of them. When the hook-arms are moved in the contrary direction, the hooks g engage with the carbons while the weight of the bars rest upon the carbons, which are thereby held down upon the tracks and are rolled along the same to and off of their upper ends. If the carbons are straight enough, their overhanging ends do not touch the contact-plate, and therefore they fall from the upper ends of said tracks downward toward a carrier-belt K to be presently described; but if the overhanging ends of the carbons are bent sufficiently they will, during the rotation of the carbons, touch the contact-plate. This, as before stated, completes the electric circuit, and a switch-plate N is permitted to move to a position where the carbons as they fall from the upper ends of the tracks will fall upon it and be guided by it onto the receiving-arms D D of the next testing device.

The switch-plate N is secured to a rock-shaft n, which extends across the machine and is mounted in the standards. On the projecting end of the rock-shaft is a toe n'. The armature f^2 of the associated electromagnet F is attached to a pivoted arm f^3, the upper end of which is adapted to be moved by a spring f^6 into engagement with this toe, as shown at the right of Fig. 3, whereby the plate N is locked in the position substantially as shown at the right of Fig. 3; but when the electric circuit is completed this arm is withdrawn by the magnet from its engagement with the toe, and thereupon the switch-plate falls by gravity to the position shown on the middle of Fig. 3, turning the rock-shaft in so doing. In this position it guides the carbons onto the arms D of the next testing device. All of the plates N are returned to the position first referred to by the following mechanism: Each rock-shaft n has at its opposite end an arm n^2. A bar P, which is capable of sliding endwise in bracket-guides c^2 on the several standards, has a pin p', which engages with said arm. In fact, it has a plurality of pins adapted to engage with the corresponding arms n^2 on the several rock-shafts n. This bar is caused to reciprocate longitudinally by a spring p^3, which moves it rearward, and by a rocking arm m', secured to arm M, which engages with a pin p^2 on this bar P and moves it forward.

The carbons to be tested, sorted, and graded are placed in a hopper H, having an inclined bottom h, on which the carbons slide by gravity down toward the lower end. A feeding device for taking carbons out of this hopper and delivering them singly onto the arms D of the first sorting is provided. This feeding device is a cylinder h', which extends through the lower end of the hopper, lying partly in and partly out of the hopper, and it is secured on a transverse shaft h^2. In the surface of the cylinder are longitudinal grooves h^3, each large enough to receive one of the carbons. The cylinder is slowly turned step by step, and with each movement it drops a carbon onto the arms D of the first sorting device. A curved retaining-plate h^4 is secured to the hopper and embraces the upper part of the cylinder outside of the hopper, and it acts to prevent the carbons from dropping out of said grooves until they reach the proper point with respect to said arms D. Attached to the same shaft h^2 is a ratchet-wheel h^5, with which a pawl t engages. This pawl is pivotally connected with a lever T, which is pivoted to the side of the hopper. A friction-roller t', which is mounted upon said lever, is adapted to be engaged by a cam u, secured upon a constantly-rotating shaft U. The lower end of this lever is connected by a link u' with one of the pivoted arms M. There are two of these arms pivotally connected to each side of the frame of the machine. The upper ends of the arms on each side of the machine are pivotally connected with a bar m^2. The two bars m^2 m^2 are connected by a plurality of transverse tie-rods m^3. The several hook-arms G are pivotally hung from these bars m^2. It is apparent, therefore, that for each revolution of the shaft U this lever T will be rocked backward and will then be moved forward by its spring t^2. The results of this movement will be, first, the turning of the feeding-cylinder the distance between two successive grooves in its surface and the consequent discharge of one carbon onto the arms D of the first testing device; second, in the backward-and-forward movement of all of the hook-arms G and the consequent movement of all of the carbons on the several testing devices upon the tracks and off the upper ends thereof. In this movement any or all of the several circuits may be completed with the result of unlocking the corresponding switch-plates, whereby the carbons are delivered onto the succeeding testing device. Those carbons which were too straight to contact with the contact-plate fall down as they leave the tracks. When the hook-arms G again move forward, the bar P is moved forward, and it returns all of the rock-shafts n to their normal positions and the arms f^3 automatically engage with the toes n'.

I will now explain in what manner the parts of the several testing devices are adjusted, so that the first pair of such devices will segregate the best of the carbons—that is to say, those which have at least one end which is straight enough for the best grade—and the next two will segregate the best of the remaining carbons, and so on. The tracks B B' in the first two testing devices are elevated a very short distance only above the top surface of the contact-plate A, and therefore a comparatively slight crook in the carbon will cause it to contact with the plate A, with the result, as stated, that said carbon will be passed on to the next testing device. The tracks of the next two testing devices are elevated above the top surface of the contact-plate a greater distance than those in the first two and those of the fifth and sixth testing devices still farther. In the first testing device the plate A is so placed that the track B is farther from the adjacent guide-plate E than the track B' is. Therefore the end of the carbon which overhangs the track B is longer than the other end, which overhangs the track B', and therefore this longer end must be straighter than the shorter end needs to be to avoid making contact with the plate A. In the second testing device the opposite ends of the carbons overhang the adjacent tracks farther and are consequently the longer. Therefore if the long overhanging end of a carbon in the first testing-machine is too crooked to go through the device without touching the plate A the other end may in the second testing device be found to be straight enough. The third and fourth testing devices are similarly differentiated, as are also the fifth and sixth.

When any of the carbons withstand the test of any testing device, such carbons do not cause the operation of the switch-plate N, by which they are passed onto the next testing device, but, on the contrary, they fall downward and are delivered upon transversely-movable endless carrier-belts K, which run over the sprocket-wheels k. Before they reach these belts, however, they pass through turning devices, whereby they are turned into position substantially at right angles to the positions which they occupied in moving along testing devices—that is to say, when they are on the testing devices their axes extend transversely of the machine, whereas they are delivered onto the carrier-belts with their axes extending lengthwise of the machine. One of these turning devices is associated with each testing device. Like the testing devices, however, the turning devices are arranged in pairs, one pair of turning devices being associated with one of the pairs of testing devices. One of the turning devices in each pair acts to turn the carbons in one direction, while the other turning device acts to turn it in the contrary direction, and both deliver the carbons onto the same belt. It will be understood, therefore, that all of the carbons which withstand the test of either testing device in any pair are delivered upon the carrier-belt associated with that pair of testing devices and that the straight ends of all of such carbons will be at the same side of said carrier-belt.

The construction of the turning devices will be understood by reference to Figs. 8, 9, 10, 11, and 12. I will first describe the turning device which is associated with the testing device at the right of Figs. 8 and 9. Directly below the upper end of the track B is a plate V, having on one edge an upwardly-extended curved flange v' and on the other edge a substantially vertical flange v^2, which extends transversely of the machine. The one end of the carbon, therefore, when it falls from the tracks will drop downward onto the plate V, substantially as shown by dotted lines in Fig. 10. A warped bar W is properly supported in such position that the other end of the carbon will fall upon it near its upper end. As this end of the carbon falls it will be guided by said warped bar through the several positions indicated by dotted lines in Fig. 10. In passing through these several positions the carbon turns against the inner vertical edge of the flange v^2 as a fulcrum, while the end of the carbon engages with the curved flange v', whereby endwise movement of the carbon is prevented. The result will be that the carbon in falling will be turned into a position substantially at right angles to its former position and when in this position will drop through a slot x in a plate X and thence onto the curved plate Z, from which it falls onto the associated carrier-belt K. This turning movement of the carbon will be very rapid, and unless means to prevent such action were provided it might swing beyond the position vertically above the slot x. This is prevented by the inner edge of a flange v^4, with which the carbon engages near one of its ends, whereby this end is prevented from passing beyond the slot x. If the other end swings too far, it engages with an inclined plate w^2, by which it is caused to roll back again and then through said slot x. The plate X referred to is fastened to some convenient part of the machine-frame, and the lower end of the warped bar W is attached to the plate X. The curved plate x^2 is a brace-bar, its lower end being attached to the plate X′, while its upper end is attached to one of the side bars of the machine-frame. The associated turning device is similarly constructed—that is to say, it has the plate V^2, down upon which one end of the carban falls after it leaves the tracks. This plate has upon one edge the upwardly-extended curved flange v^3 and upon the other edge the vertical flange v^4. A warped bar W′, which is curved in the opposite direction to the bar W, is suitably supported, its lower end being made fast to a bar X′ below the bar X, while its upper end is connected by a brace-bar w^3 in such position that one end of the carbon will fall upon it. The result is that while one end of the carbon will fall down upon the plate V^2 the other end will roll down the bar w', and the carbon will turn upon the inner edge of the flange v^4 as a fulcrum, and the extreme end of said carbon will engage with the curved flange v^3. The result is that this carbon will be turned in the opposite direction to the carbon which falls upon the other turning device and will be delivered through a slot x' onto the same plate Z. A curved plate w^4 is attached to the bar X′, so that if the momentum of the carbon carries it back of the slot x' it will again roll down the bar w^4 to said slot. A depending bracket x^4, secured to the plate X, serves to prevent the other end of the carbon swinging past the opening in the plate X′ through which it is desired that it shall pass.

It will be remembered that the testing device shown at the right of Figs. 9 and 10 is one which is set to determine whether the rear end of the carbon passing over it is straight enough. If it is found to be and falls down into the embrace of the turning devices, that straight end of the carbon will be deposited on the associated carrier-belt K with its straight end at the left side thereof, as seen in Fig. 9. The testing device shown at the left of said figure is set to determine whether the other end of the carbon is straight enough. If it is found to be, it falls into the embrace of the other turning device and, being turned in the opposite direction, is deposited on the carrier-belt with its straight end at the left side of said belt. In other words, the carbons which are deposited upon the several carrier-belts are deposited thereon with their straight ends pointing in the same direction. The first carrier-belt will therefore carry to a suitable delivery-point all of the carbons which may be classed as first grade and will deliver said carbons with their straight ends in the same direction. The next carrier-belt will similarly deliver the carbons of the second grade—that is to say, those carbons which withstand the test of the second pair of testing devices, and so on.

Having described my invention, I claim—

1. In a carbon-sorting machine, the combination of tracks connected with one pole of an electric circuit, a metallic contact-plate below but insulated from said tracks and connected with the other pole of said circuit, insulated guide-plates for engaging with the ends of carbons which rest upon said tracks, means for rolling the carbons along said tracks, and a device which is caused to operate when the electric circuit is closed by the contact of a carbon on said tracks with said plate, substantially as specified.

2. In a carbon-sorting machine, the combination of tracks connected with one pole of an electric circuit, a metallic contact-plate

below but insulated from said tracks and connected with the other pole of said circuit, insulated guide-plates for engaging with the ends of carbons which rest upon said tracks, and means for rolling the carbons along said tracks, with a switch-gate, a locking device for holding it in a certain position, an electromagnet connected in said electric circuit, and means operated by said magnet for releasing said locking device, substantially as specified.

3. In a carbon-sorting machine, the combination of tracks connected with one pole of an electric circuit, a metallic contact-plate which is below but insulated from said tracks, and is connected with the other pole of said circuit, hook-arms for engaging with said carbons and rolling them along said tracks, movable supports to which said hook-arms are pivotally connected, and a device which is caused to operate when the electric circuit is closed by the contact of a carbon on said tracks with said plate, substantially as specified.

4. In a carbon-sorting machine, the combination of tracks connected with one pole of an electric circuit, a metallic contact-plate which is below but insulated from said tracks and is connected with the other pole of said circuit, arms having their lower front ends beveled and having hook formations in their lower edges and back from said beveled ends, and longitudinally-movable supports to which the upper ends of said arms are pivoted, substantially as specified.

5. In a carbon-sorting machine, the combination of tracks connected with one pole of an electric circuit, a metallic contact-plate which is below but insulated from said tracks and is connected with the other pole of said circuit, guide-plates secured upon but insulated from said contact-plate, hook-arms for engaging with the carbons and rolling them along said tracks, and means for moving said hook-arms backward and forward lengthwise of said tracks, a movable switch-gate, an electromagnet connected in said electric circuit, and means controlled by said magnet for holding said switch-gate in one of its positions and for releasing it whereby it may move to another position, substantially as specified.

6. In a carbon-sorting machine, the combination of a hopper, a feeding device consisting of a cylinder having grooves adapted to receive the carbons which cylinder lies partly within and partly outside of said hopper, and a testing device consisting of the metallic contact-plate which is connected with one pole of an electric circuit, tracks secured to but insulated from said contact-plate and connected with the other pole of the circuit, and arranged with relation to the feeding-cylinder substantially as described whereby the carbons from said cylinder are deposited upon said tracks, and means for rolling the carbons along said tracks, substantially as specified.

7. In a carbon-sorting machine, the combination of a plurality of testing devices arranged in series each consisting of the tracks which are connected with one pole of an electric circuit, a metallic contact-plate which is insulated from said tracks and is connected with the other pole of said circuit, means for rolling a carbon along said tracks and off their ends, receiving-arms projecting in front of said tracks, a switch-gate placed between the rear end of one of said testing devices and the forward end of the other which switch-gate is adapted to assume a position whereby the carbons which fall from the tracks of one testing device will be guided onto the receiving-arms of the next testing device, a locking device for holding said switch-gate out of said position, an electromagnet connected in said circuit, and means operated by the magnet for releasing said locking device, substantially as specified.

8. In a carbon-sorting machine, the combination of a plurality of testing devices arranged in series, each having a metallic contact-plate which is connected with one pole of an electric circuit, and tracks which are insulated from said contact-plate and are connected with the other pole of said circuit, switch-plates interposed between the succeeding testing devices, an electromagnet associated with each testing device, a locking device for holding the switch-plate in one of its positions, and means operated by the electromagnet for releasing said locking device, combined with arms pivoted to the sides of the frame of the machine which contains said testing devices, bars pivotally connected with the upper ends of said arm, tie-rods connecting said bars, and two hook-arms associated with each of said testing devices which hook-arms are pivotally suspended from said bars, substantially as specified.

9. In a carbon-sorting machine, the combination of a testing device over which the carbons are rolled to determine their straightness, a carrier-belt movable below said testing device in a direction at right angles to that in which the carbons are rolled upon the testing device, and a turning device intermediate of the testing device and belt, whereby the carbons, in falling from the former to the latter, are turned into positions at right angles substantially to their positions on the testing device, substantially as specified.

10. In a carbon-sorting machine, the combination of a pair of testing devices over which the carbons are rolled to determine their straightness, said testing devices being adjusted to test opposite ends of the carbons, means whereby a carbon which fails to stand the test of one testing device is delivered onto the other, and a transversely-movable carrier-belt below said testing devices, with two turning devices associated with said testing devices and located between them and said carrier-belt, one of said turning devices being adapted to turn the carbons in one di-

rection as they fall from one testing device toward the belt, and the other being adapted to turn said carbons in the opposite direction as they fall from the testing device to the belt, whereby the carbons from both testing devices are delivered onto the same carrier-belt in positions at right angles to their positions upon the testing devices, but with their straight ends at the same side of the carrier-belt, substantially as specified.

11. In a carbon-sorting machine, a device for turning carbons and the like which consists of a plate onto which one end of a carbon may fall, said plate having a curved flange and a vertical flange, combined with a warped bar whose upper end is arranged so that the opposite end of the carbon will fall upon it, substantially as specified.

12. In a carbon-sorting machine, a device for turning carbons and the like which consists in the combination of a plate V having a curved flange v' and a vertical flange v^2 with a warped bar W, an inclined plate w^2 and a stop-flange as v^4, substantially as specified.

13. In a turning device for carbons and the like, the combination of a slotted plate X, the plate X′ below it, the plates V V^2 each having a curved flange, and a vertical flange, with two oppositely-turned warped bars whose lower ends are secured respectively to the two plates X and X′, the inclined plates w^2 w^3 and the downwardly-extended bracket Y, substantially as specified.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

MAHLON M. ZELLERS.

Witnesses:
E. L. THURSTON,
FRANK D. LAWRENCE.