(No Model.) 2 Sheets—Sheet 1.

F. W. INGRAM & E. E. CARR.

OSCILLATING GRATE BAR.

No. 494,865. Patented Apr. 4, 1893.

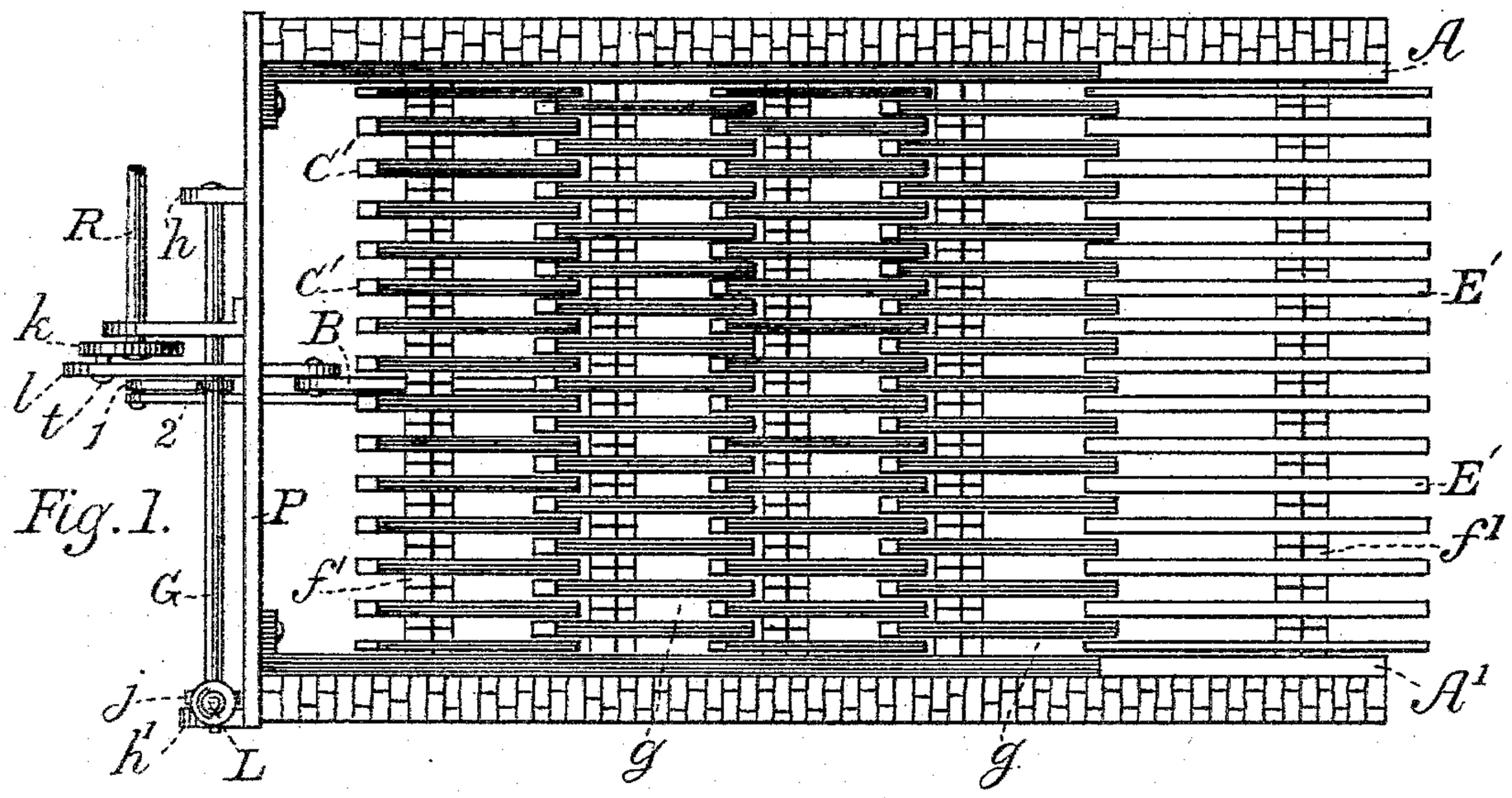

Fig. 1.

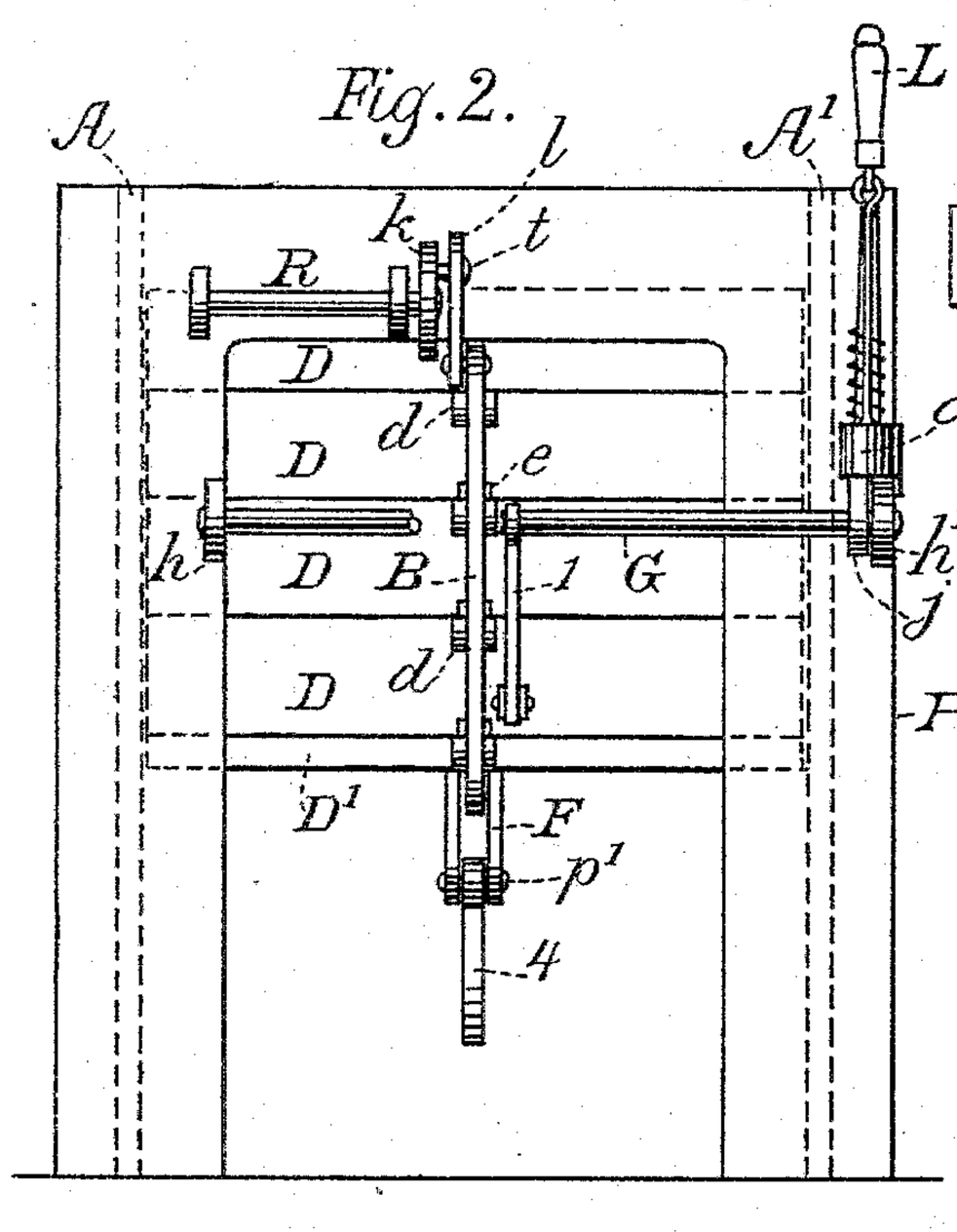

Fig. 2.

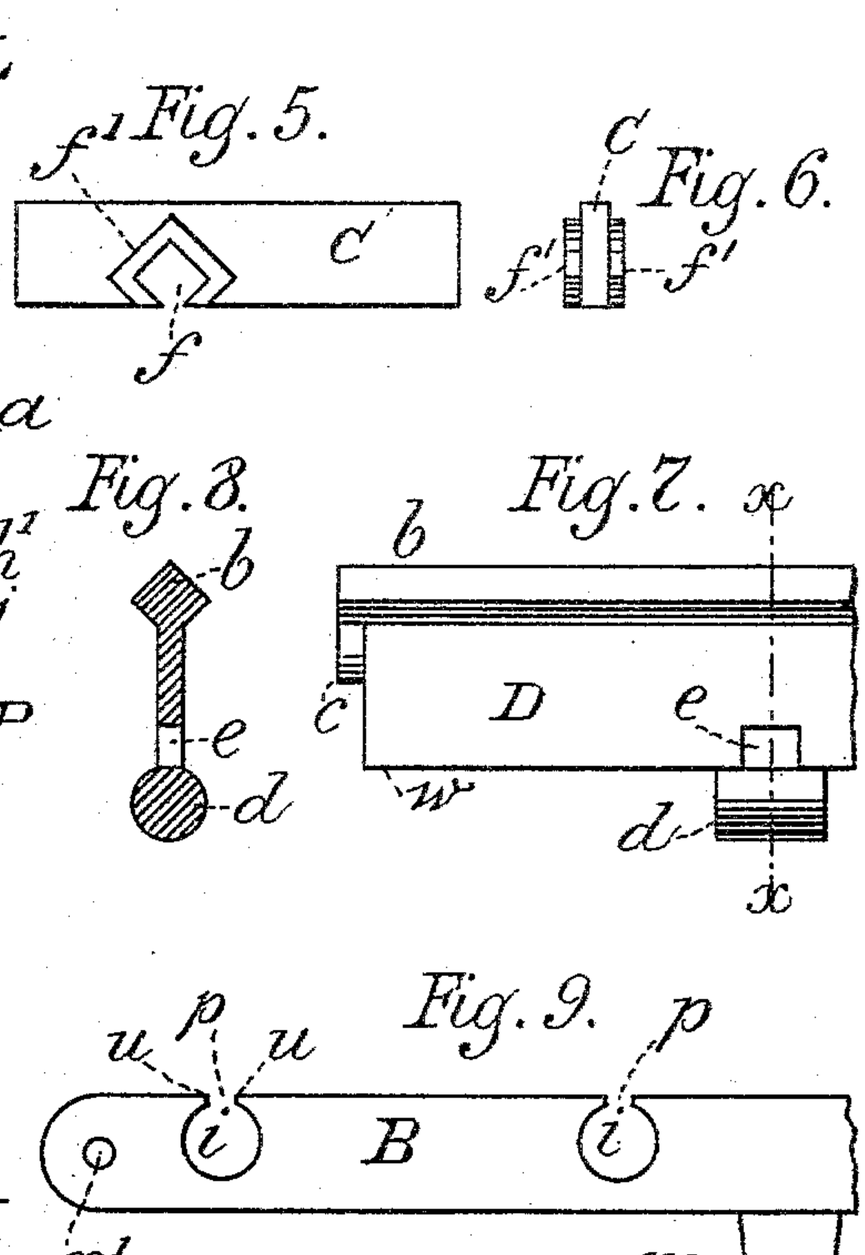

Fig. 5.

Fig. 6.

Fig. 8.

Fig. 7.

Fig. 9.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

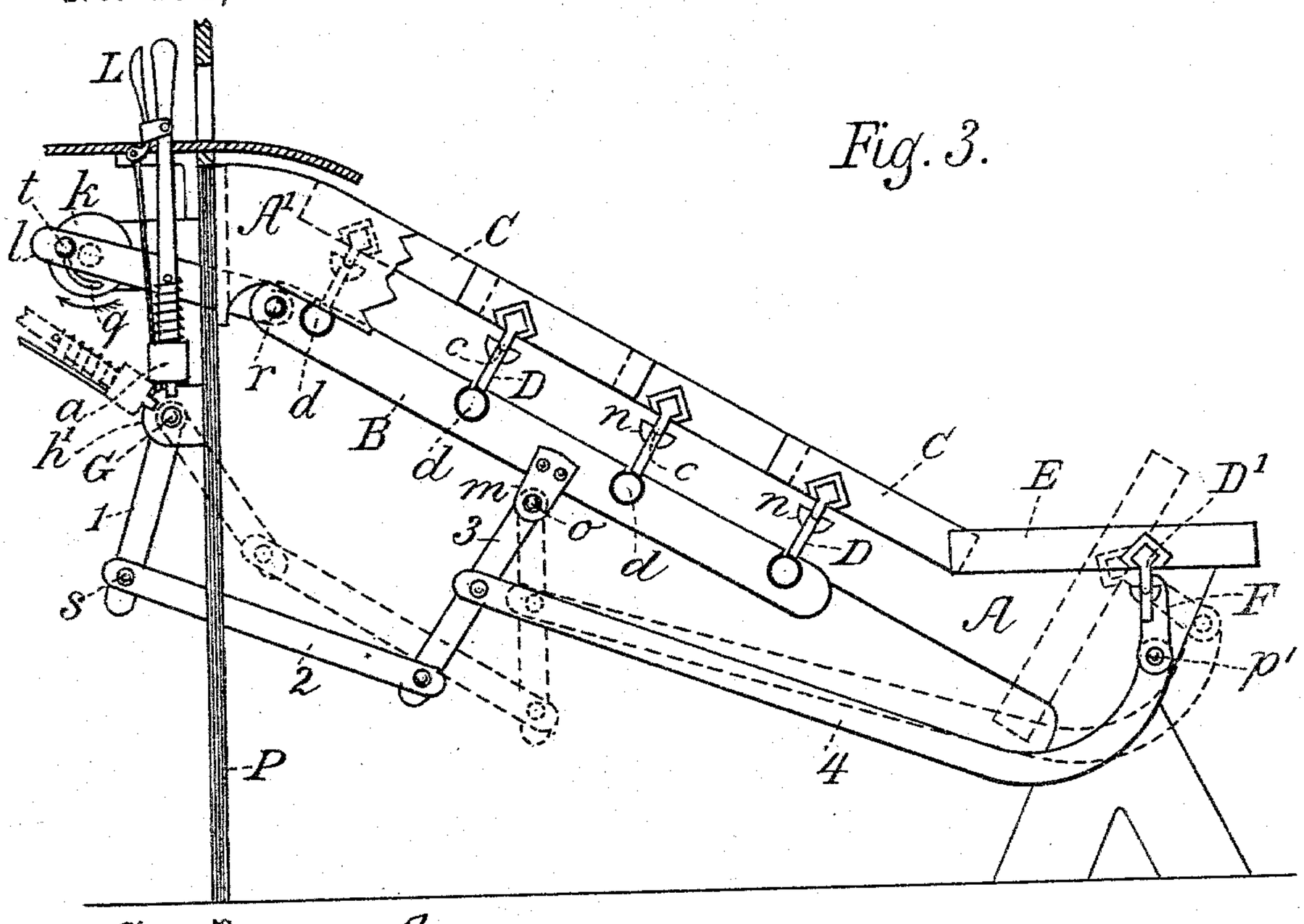
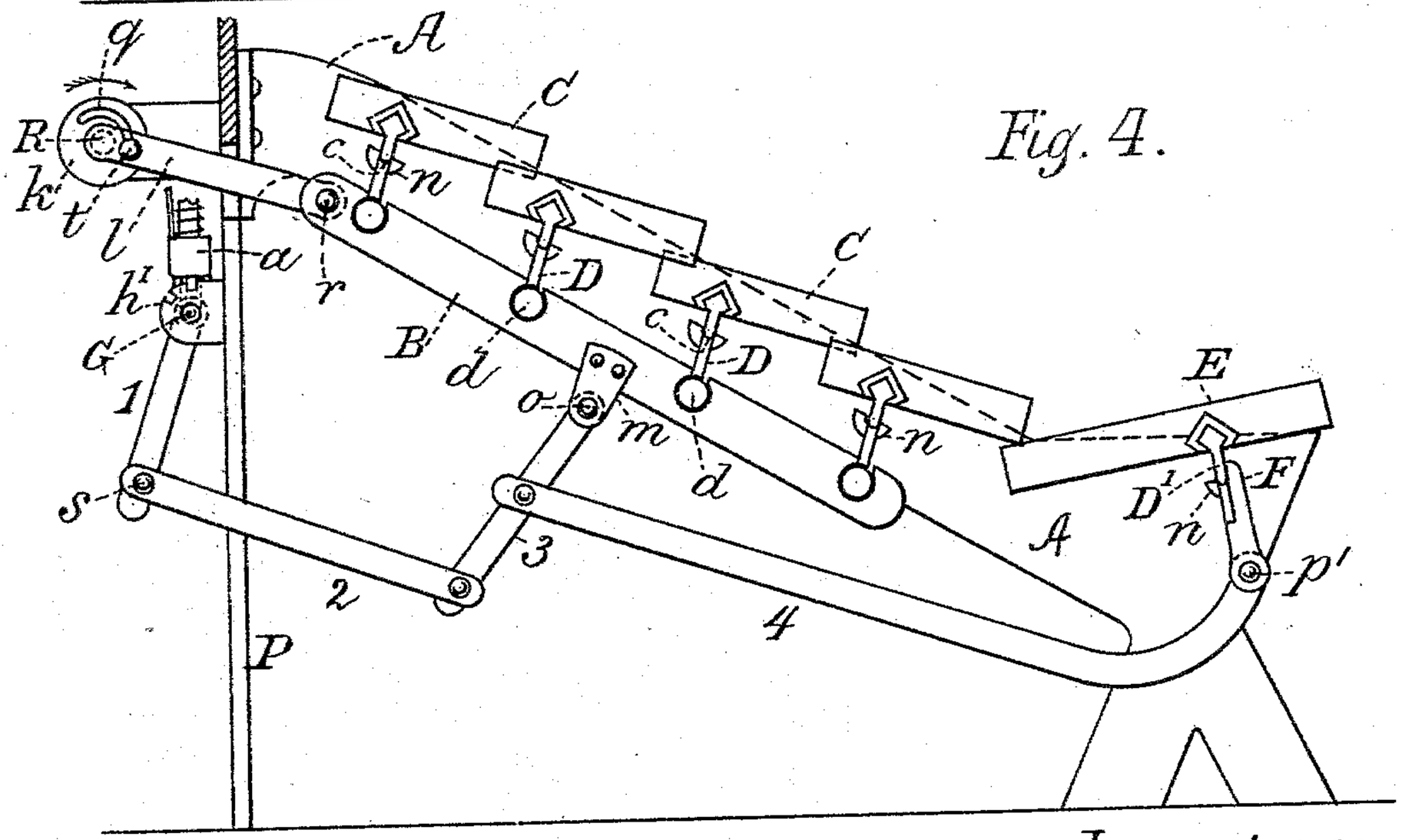


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANKLIN W. INGRAM AND ELMER E. CARR, OF CHICAGO, ILLINOIS.

OSCILLATING GRATE-BAR.

SPECIFICATION forming part of Letters Patent No. 494,865, dated April 4, 1893.

Application filed October 9, 1890. Serial No. 367,604. (No model.)

To all whom it may concern:

Be it known that we, FRANKLIN W. INGRAM and ELMER E. CARR, citizens of the United States of America, residing at Chicago, in the county of Cook, State of Illinois, have invented a new and useful Improvement in Oscillating Grate-Bars, of which the following is a description, reference being had to the accompanying drawings, the same forming a part of this specification.

Our invention relates to grates having oscillating sections, and consists in a novel construction, combination and arrangement of parts, whereby such grates are rendered more effective for the purposes of burning fuel, and can be manipulated more conveniently than heretofore.

In the accompanying drawings, Figure 1 is a top view of our invention. Fig. 2 is a rear end view of the same. Fig. 3 is a broken side elevation, and Fig. 4, a longitudinal section. Figs. 5 and 6 represent respectively a side and an end view of one of the fingers of a section. Fig. 7 is a broken side view of the bar portion of a section. Fig. 8 is a cross section of the bar portion on the line x—x, and Fig. 9 is a broken side elevation of the operating bar.

A A′ represent side supporting bearers extended upwardly on an inclined plane and secured to an iron frame P, their horizontal front-end portions resting upon the bottom of the ash pit of the furnace. On the inner surface of these bearers are equally spaced concaved supporting lugs n.

C and E are the sections of the grate, formed respectively with semi-circular journals or rockers c on their ends. These journals rest in the lugs n and permit the sections to be oscillated. The journals may be rocker shaped projections, [as c, in Fig. 7,] from the ends of the tetragon portions b of the sections. Each of the sections C and also the section E, comprises a transverse bar D and fingers C′ E′, the fingers being connected to the tops of the bars D and D′ by means of a tetragon shaped thickened top portion of the bar portions D D′, and a correspondingly shaped slot or passage f in the fingers of each section. On each side of the respective sections a tetragon shaped boss or flange f' is provided for spacing the sections and shedding the ashes. The portions D D′ of the sections are in form of broad flat plates and each of these plates at its lower edge is increased in depth near the middle of its length, by forming on it a short thickened circular extension d, said extension serving for forming a joint connection between the section and the operating lever. In each of the portions D of the sections an air passage e is provided just above and centrally of the circular extension d. The fingers of the sections are so arranged that those on one bar portion D extend a short distance between those on another bar portion D, and thus the fingers of one section enter between the fingers of another section, and are out of longitudinal line with those of fellow sections, but at the same time a continuous surface for the fuel to rest upon is secured, while air spaces g are left between the sections or the fingers thereof for the passage of air through the grate to the fire; air is also free to pass through the passages e of the bar portions D; and by this means a perfect combustion of the fuel is insured. The fingers C′ by being formed with slots or passages f of tetragon shape, and with spacing flanges or bosses f' of similar shape, can be slipped upon the tetragon tops of the bar-portions D D′ of the sections, and when in position are held from any movement on said tops, while, if it becomes necessary, they can be readily removed by slipping them off the tetragon heads. The peculiar shape of the flanges enables them to shed the ashes, while their office is to keep the fingers of the sections at proper distances apart to allow for the passage of air between them to the fire. The foot section E has a bracket F near the middle of its bar portion D′, whereby it can be pivotally connected at p' to operating mechanism, comprising a reciprocating bar B, bracket lug m, link l, shaft R and eccentric k; and links 2 and 3, connecting rod 4, lever L, rock shaft G, arm 1, notch plate h' and a locking bar. The reciprocating bar B is provided with notches i, u, and p, properly spaced and adapted to receive the nearly circular portion d of the grate bar portion D of the section C, and when said bar B is connected to the said grate bar portion D, in the manner illustrated in Figs. 3 and 4, it becomes suspended upon the nearly circular extension d of the grate bar portions D. The link l is connected to

the rear end of the reciprocating bar by a pivot *r* and to an adjustable wrist or crank pin *t* of the disk *k* on shaft R. A curved eccentric slot *q* is provided in the disk *k* and the pin *t* fits in this slot and is fastened at any determined point so as to regulate the extent of the movement of said bar B when the grate sections are operated by it. It is important that the mechanism for dumping the section E shall be simple in its arrangement and convenient of operation, and to this end the link 3 is connected to the lug *m* of the bar B by a pivot *o;* and to the middle of the length of this link the connecting rod 4 of said section is pivoted; and then to the lower end of the link the connecting rod 2 is pivoted, and this rod is connected to the arm 1 of the rock shaft G. On the outer end of the shaft G a hand lever is rigidly fastened, said lever having a spring sliding locking bar applied to it in a well known manner, as shown in the drawings. The locking bar works in a stop or notch plate *h'*, and by releasing the locking bar and vibrating the hand lever, the foot section E of the grate can be adjusted to the position shown by full lines in Figs. 3 and 4, and to the position indicated by dotted lines in Fig. 3, and the said section thereby caused to dump its load in the ash pit. By returning the lever to its normal position, the section E can be readjusted to the position shown in full black lines in Figs. 3 and 4, in which position it is locked by the bar falling into a notch in the plate. The notches *i*, *u*, and *p*, are so formed on the reciprocating bar that while this bar is capable of being slipped endwise on and off the nearly cylindrical extension *d*, said bar cannot move up or down after being located in position, and while this is so the air can pass freely through the bar at the opening *e* on each side of the bar and directly over it. It is obvious that the bar B by being constructed with notches having a nearly cylindrical portion *i* and narrow slotted portions *p* and *u*, the grate bar portions D will be permitted to oscillate during the reciprocations of said bar, and that this movement of the grate bar portions D will be accommodated by the openings *e* into which the walls of the narrow portion of the openings *u* and *p* enter slightly during the vibrations. It is also obvious that the adjustable wrist pin *t* allows of the throw of the disk being decreased or increased, and the vibratory movement of the grate regulated thereby.

For revolving the shaft R, the most desirable well known means, is a worm and a screw wheel, as such means insure very gentle, easy and constant vibratory movements of the grate bars, but any other well known gearing may be adopted for this purpose, and no claim is set up here for any special means for revolving the shaft.

The operation is as follows: Fresh coal is spread over the entire surface of the grate sections C and E, and at this stage the section C may be on a single inclined plane, as in Fig. 3, and the section E on a horizontal plane, or the said sections C and E may be relatively, so far as their upper surfaces are concerned, in the position shown in Fig. 4. The fire is started through the front of the furnace at the top of the grate with kindling and larger wood, in the usual way, and, after it is well started, the shaft R is set revolving and constant vibratory motion thereby imparted to the grate sections, and they are caused to assume alternately the positions shown in Figs. 3 and 4. Now, assuming the grates to be continuously working and the sections changing their positions from that shown in Fig. 3 to that shown in Fig. 4 and vice versa, the mass of coal will be loosened and broken up by the fingers of one section passing up between those of another section, and while this is going on, a free supply of air is allowed to pass through the grate sections, and the disintegrated mass of coal, such air keeping the grate cool and insuring perfect combustion. The continuous vibration of the sections of the grate causes the coal to gradually work down the inclined surface of the fire bed C toward the dumping section E, on which section the final burning takes place. It will be understood that whatever clinker forms on the inclined grate surface will be gradually worked down and deposited upon the dumping section, and that the same can be dumped with other débris into the ash pit at any time by simply throwing said section from the position shown in full black lines in Fig. 3 to the position shown in dotted lines in said figure, this being accomplished by unfastening the lever L and moving it from the position shown in full black lines to the position shown by dotted lines in Fig. 3. During this dumping operation the motion of the grate sections C should be stopped in order to prevent the coal lying on said sections sliding down into the ash pit. In an actual furnace, a feed hopper is secured to supports above the grate and coal allowed to fall by gravity upon the upper or top section so as to have fresh coal take the place of that which is being constantly worked down. During the firing of the fuel on the grate, the shaft R can be worked by hand in case the motive power for turning it is not ready or out of order, but it is intended that the shaft shall be run constantly, excepting at the time when the fire is being started or when the dumping section is being dumped for the purpose of clearing the furnace.

What we claim as our invention is—

1. The combination of the bearers provided with concaved supporting lugs *n* for the journal projections *c* of grate sections to rest and vibrate in, grate sections C comprising flat, broad, pendent bar portions D having tetragon top portions *b*, journal portions *c*, nearly cylindrical portions *d*, air passages *e* and fingers or blades having tetragon slots on their under side and some distance from their rear ends; and tetragon flanges on each of their

sides, and the fingers of one section entering between the fingers of another section; the dumping foot section E corresponding substantially in construction with the sections C, a reciprocating bar B having notches *i*, *u*, *p* cut in its upper side, into which the portions *d* of the sections C are slid, the link *l*, disk *k* having wrist pin *t*, and a revolving shaft, substantially as and for the purpose described.

2. A grate formed of sections, the fingers of one section entering a short distance between the fingers of another section, and the sections comprising, respectively, fingers with tetragon passages through them and with similar shaped spacing bosses, and a bar portion with journaled ends, tetragon head and nearly circular connecting bottom extension, a reciprocating bar having notches in its top, a link an eccentric, a revolving shaft, and suitable bearers having supporting lugs, substantially as and for the purpose described.

3. A grate comprising oscillating sections C, reciprocating operating bar B, and the oscillating section E, connecting rod 4, lug *m*, links 2 and 3 suspended on bar B, rocking shaft G, arm 1, and lever L, substantially as and for the purpose described.

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Attest:
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