(No Model.)

4 Sheets—Sheet 1.

W. U. FAIRBAIRN.

STEAM BOILER SETTING.

No. 426,255. Patented Apr. 22, 1890.

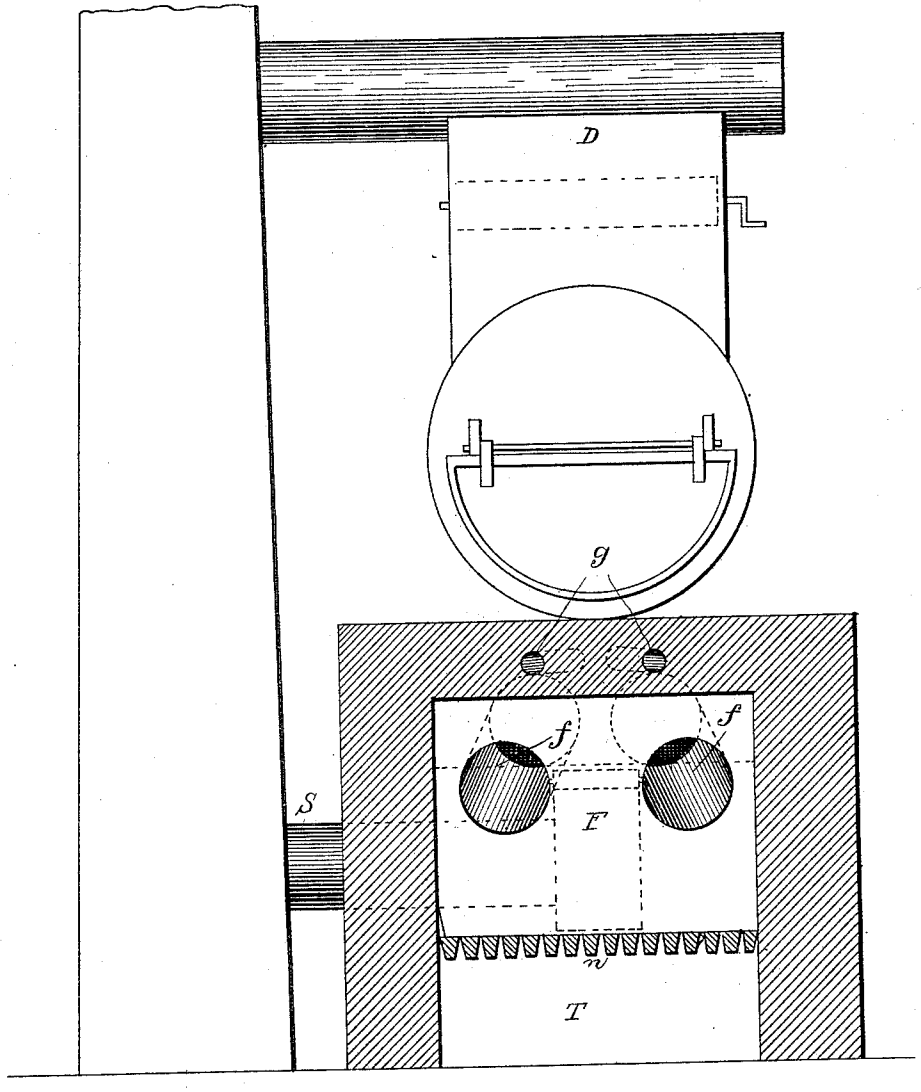


Fig. 1.

WITNESSES.
J. M. Dolan
A. P. Porter

INVENTOR.
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by his atty
Charles Burgwardt

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W. U. FAIRBAIRN.

STEAM BOILER SETTING.

No. 426,255. Patented Apr. 22, 1890.

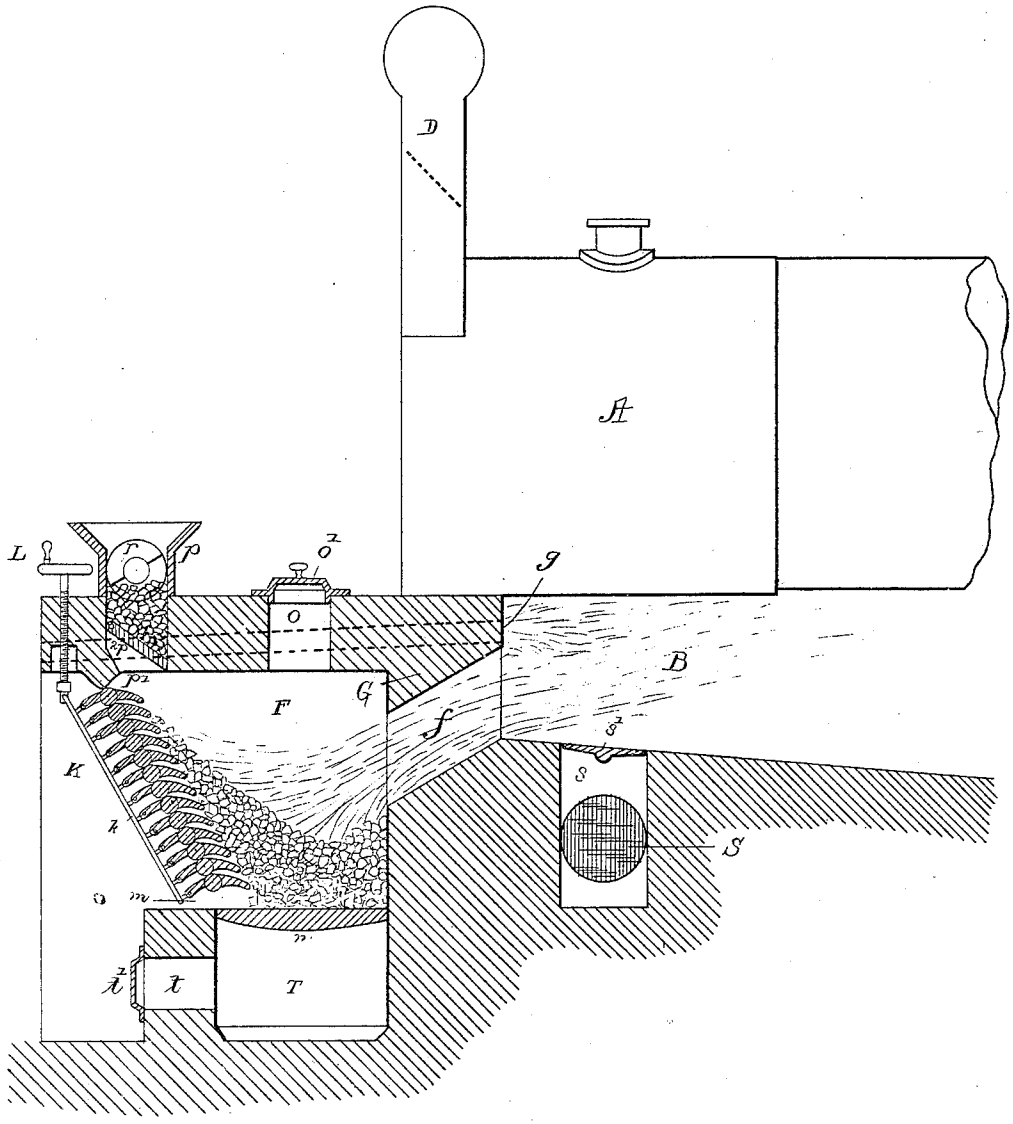


Fig. 2.

WITNESSES.
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Clarke & Sajenard

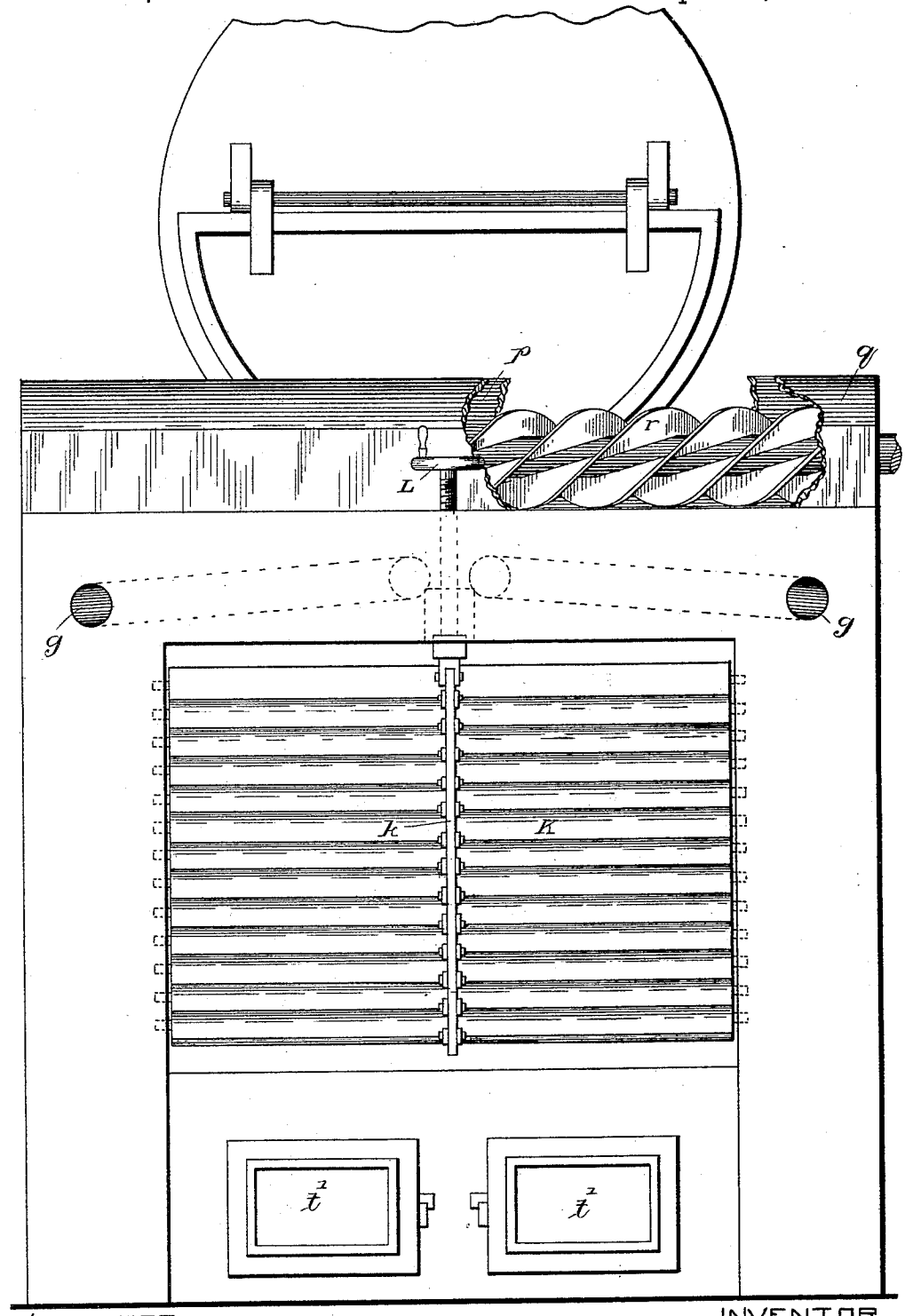
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W. U. FAIRBAIRN.

STEAM BOILER SETTING.

No. 426,255. Patented Apr. 22, 1890.



WITNESSES.
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Fig. 5.

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(No Model.) 4 Sheets—Sheet 4.

W. U. FAIRBAIRN.

STEAM BOILER SETTING.

No. 426,255. Patented Apr. 22, 1890.

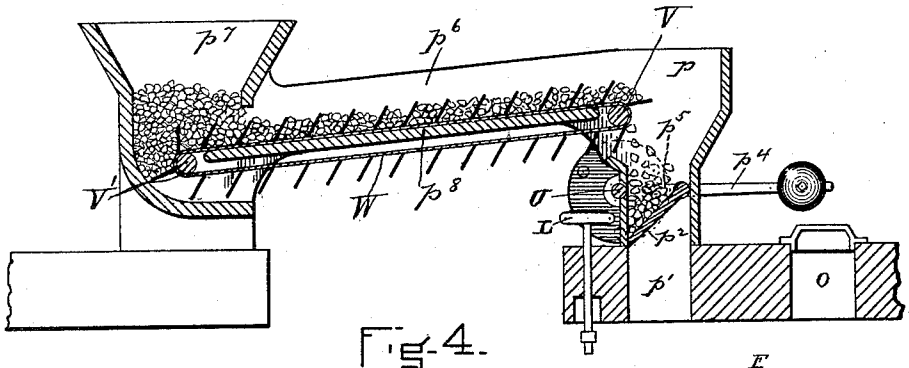


Fig. 4.

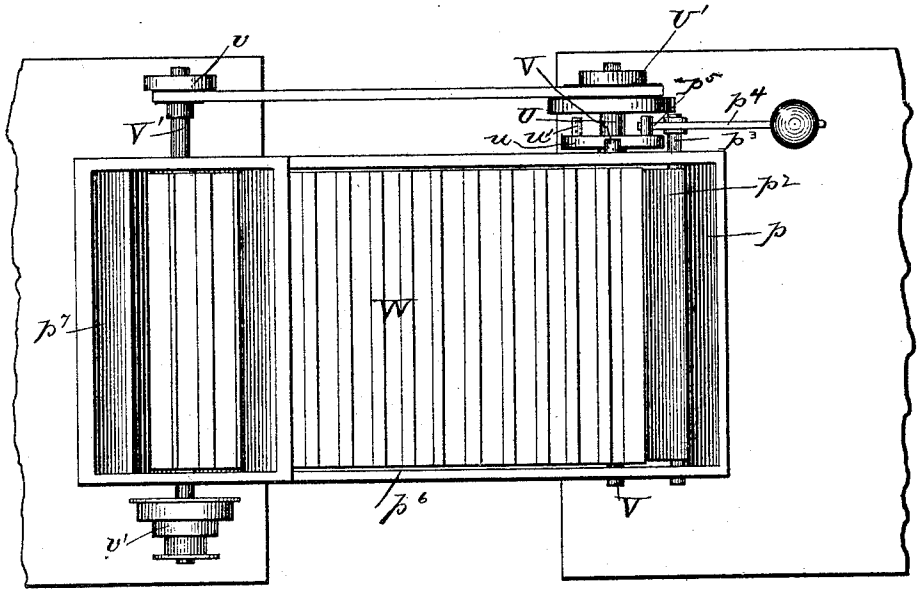


Fig. 5.

WITNESSES.
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A. P. Porter

INVENTOR.
Wm. U. Fairbairn
by his attys
Auke & Sprague

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UNITED STATES PATENT OFFICE.

WILLIAM U. FAIRBAIRN, OF HYDE PARK, MASSACHUSETTS.

STEAM-BOILER SETTING.

SPECIFICATION forming part of Letters Patent No. 426,255, dated April 22, 1890.

Application filed September 21, 1889. Serial No. 324,607. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM U. FAIRBAIRN, of Hyde Park, in the county of Norfolk and State of Massachusetts, a citizen of the United States, have invented a new and useful Improvement in Steam-Boiler Setting, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

This improvement is designed to effect a more perfect combustion of the fuel employed to heat steam-boilers and to utilize as much as possible of the heat generated.

Much of the construction hereinafter referred to or described has been already described in Letters Patent granted to me March 27, 1888, No. 380,197, and the improvements on the apparatus described in said Letters Patent are mainly in and around the fire-box.

In the drawings, Figure 1 is a transverse section across the fire-box just in front of the bridge-wall. Fig. 2 is a longitudinal section through the fire-box and the flue beneath the boiler adjacent to the fire-box. Fig. 3 is a front elevation of the fire-box; and Figs. 4 and 5 illustrate a method of automatically feeding fuel to the fire-box, which in some instances and for some purposes I am inclined to prefer to the Archimedean screw shown in Fig. 3.

Like letters indicate like parts in all the figures.

In the drawings, A is the boiler, and B is the flue under the boiler. The flame returns through internal tubes, as is usual in boilers, and D is the uptake which leads to the stack. F is the fire-box.

G is the bridge-wall interposed between the fire-box and the flue B beneath the boiler. The bridge-wall is pierced with the converging upwardly-directed flues *f*, as described in the patent referred to, and the walls of the fire-box are pierced with air-channels *g*, (shown in dotted lines in Fig. 2,) all substantially as shown in the patent referred to.

The fire-box F of the present contrivance has in lieu of the ordinary fire-front of a boiler-setting a front, as shown in Fig. 2, consisting of a series of slats, each of which is pivoted to the walls of the fire-box or to sockets fixed thereon, the line of the axes being somewhat inclined from the vertical. These pivoted slats are marked K in Fig. 2. They are connected to the slat-rod *k* by links or pivots, very much as the oscillating slats of a window-blind are connected to the slat-rod of the window-blind, and this slat-rod *k* is attached to the lifting-shaft L, which in Fig. 2 is shown as a hand-wheel and screw-rod with a swivel on its end, by which the series of slats K may be oscillated severally upon their centers, and by such oscillation caused either to lap upon each other, so as to prevent the passage of air into the fire-box through the front thereof, or to permit more or less air to pass between the slats. The interval between the hubs of these slats which fit upon the pivots may be considerably greater than is shown, so as to allow of considerable passage of air, if desired.

It will be observed that when the slats are horizontal, or nearly so, there is a considerable interval *m* beneath the lowest of them, through which the bed of coals resting on the grate-bars *n* may be sliced or poked. There is a man-hole *o*, with a cover *o'*, on the top of the fire-box, through which, if desired, coal may be fed. The hopper *p* extends across the whole width of the fire-box on top, and the bottom of this hopper is connected by a man-hole *p'* with the front part of the fire-box F. This man-hole *p'* is closed at its bottom by a swinging shelf p^2, which can be oscillated on a pivot at one corner, and when thrown downward toward the perpendicular will dump the charge of fuel which is above the swinging shelf into the fire-box. A trough *q* (shown in Fig. 3) continues from this hopper *p* in the direction of a coal-bunker, which delivers fuel into the trough, and this fuel is moved along the trough to the hopper *p* by means of the Archimedean screw *r*, which is set in motion as desired. It is sometimes desirable, in burning highly-combustible fuel, to stop the generation of steam rather than to generate the steam in the boiler and blow it off, when work is shut down, through a safety-valve. In order to do this it is desirable to prevent the gases of combustion from passing under the boiler and through the tubes. This may readily be done by an auxiliary flue placed near the fire-box in the bottom of the boiler-flue B, which auxiliary flue is in constant

communication with the uptake, but may be put in communication with the boiler-flue B or not, as the operator may desire. In the drawings, Fig. 2, S is such an auxiliary flue, which is carried through the masonry beneath the boiler-flue B to the uptake, and has a flue of proper size *s* communicating with the boiler-flue B. A damper *s'*, operated from outside the casing by any convenient sort of handle, opens or closes the communication between the flue *s* and the boiler-flue B at the will of the operator.

In the bottom of the fire-box F grate-bars *n* of the ordinary character are placed, and there is the usual ash-pit T beneath the fire-box, with the usual ash-hole *t* and ash-door *t'*.

In Figs. 4 and 5 is shown—in Fig. 4 a longitudinal section and in Fig. 5 a plan—a coal-feeding apparatus somewhat different from that illustrated in Figs. 2 and 3. The hopper *p*, with its man-hole *p'* and swinging shelf p^2, are still retained; but the means of feeding coal to the hopper differ from those already described, and the coal is dumped into the fire-box at regular intervals. The swinging shelf p^2 is mounted on a shaft p^3, which is pivoted in the side of the hopper, and on one end of this shaft is a weighted lever p^4, which serves to counterbalance the swinging shelf and the coal which may be deposited upon it. On the opposite side of the shaft from the weighted arm p^4 is a projection p^5, and this projection is tripped from time to time by one of the pins *u'* in the wheel *u*. This wheel *u* is carried upon a shaft U, (shown in Fig. 4,) which shaft revolves in bearings on the outside of the hopper *p* and is driven by one of the cone-pulleys U'. Above this shaft U is another shaft V. A trough p^6, in continuation of the hopper *p*, extends toward a coal-bunker p^7, which terminates downward in a hopper-shaped delivery end, and near the bottom of this hopper-shaped delivery end is placed another shaft V', which has a set of cone-pulleys *v* on one end, which engage with the cone-pulleys U' upon the shaft U, and at the other end a set of cone-pulleys *v'*, to which power is applied from the engine or prime motor. By this system of gearing any desired rate of speed may be given from the prime motor to the shaft V', and from that shaft to the cone-pulleys U'. An endless elevator-belt W, carrying vanes, is placed around the shafts V V', or around drums upon said shafts, and a diaphragm p^8 extends from side to side of the trough p^6, below the upper member of this endless belt. The speed at which the shaft V' is revolved will determine the speed at which coal is taken from the bunker p^7 and carried to the hopper *p*. The number of times that the coal will be dumped in a given period will depend upon the number of pins *u'* in the wheel *u* or on the speed of revolution of the shaft U. This speed of revolution can be governed within reasonable limits by shifting the belt between the shafts U and V' to different diameters of the cone-pulleys carried on said shafts. I am inclined to prefer this method of feeding for the fire-boxes of a single boiler; but I think the Archimedean screw would be preferable for the fire-boxes of a gang of boilers.

By feeding the fuel, particularly if it be an easily-volatilized fuel, into the very front of the fire-box, it will fall upon the ends of the slats of the fire-front and will be partly supported by them in consequence of the inward inclination of the line of pivots, so that all along the edge of these slats there will be a comparatively thin layer of the freshest fuel admitted to the fire-box. This fuel can have sufficient air supplied to it through the interstices of the fire-front to properly distill it and volatilize it to the condition of carbonic oxide and carbonated hydrogen, but little carbonic acid being formed, and this gas thus made and highly incandescent will go forward through the flues *f*, and on reaching the main boiler-flue B will be furnished with the highly-heated air necessary for complete combustion arriving at this point through the air-ducts *g*; but such perfect and complete distillation of the fuel will not take place if the fire is fed altogether through the man-hole *o*, which is nearer the bridge-wall than the man-hole *p'*, and without the ability inherent in this form of slatted fire-front to control the admission of air to this fresh fuel as it is drying and distilling the distillation would be less efficient and the control of the quality of the products of distillation much less nice than it is with the apparatus here shown.

I claim as my invention and desire to secure by Letters Patent—

1. The combination of the fire-box F with the fire-front K, composed of a blind of pivoted slats combined with each other and adapted to be operated in unison by means of the slat-rod *k* and suitable actuating mechanism, substantially as described.

2. The combination of the fire-box F, its fire-front K, composed of pivoted slats adapted to be oscillated upon their centers, and hopper *p*, man-hole *p'*, and dumping-flap p^2, substantially as described.

3. The combination of the wheel *u*, its pins *u'*, with the hopper *p*, swinging flap p^2, and weighted lever p^4, provided with the trip p^5, substantially as and for the purpose described.

WILLIAM U. FAIRBAIRN.

Witnesses:
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J. M. DOLAN.