H. LINDSAY.

LOCOMOTIVE STOKER.

APPLICATION FILED OCT. 12, 1917.

1,305,655.

Patented June 3, 1919.

5 SHEETS—SHEET 1.

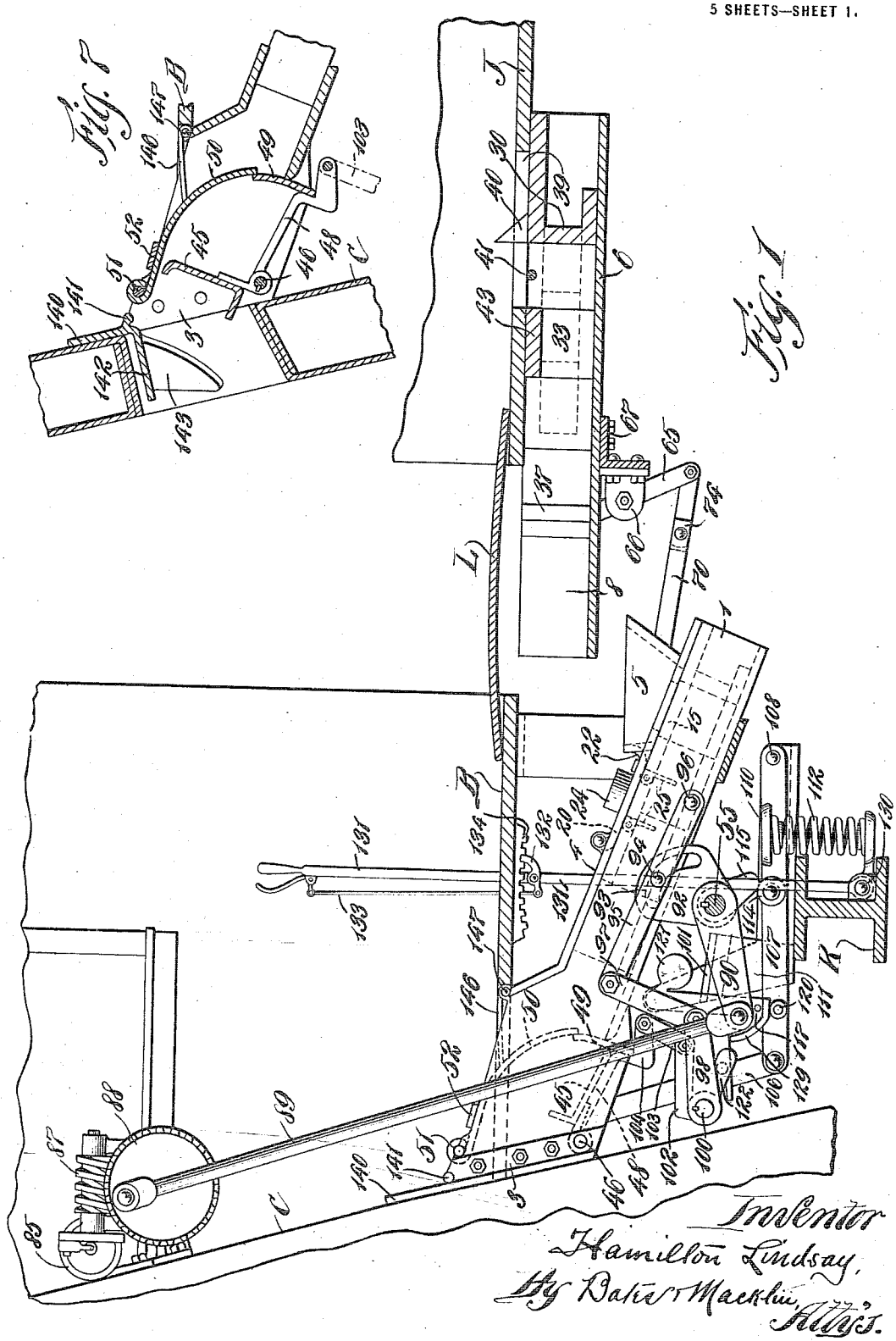

Fig. 1.

Fig. 2.

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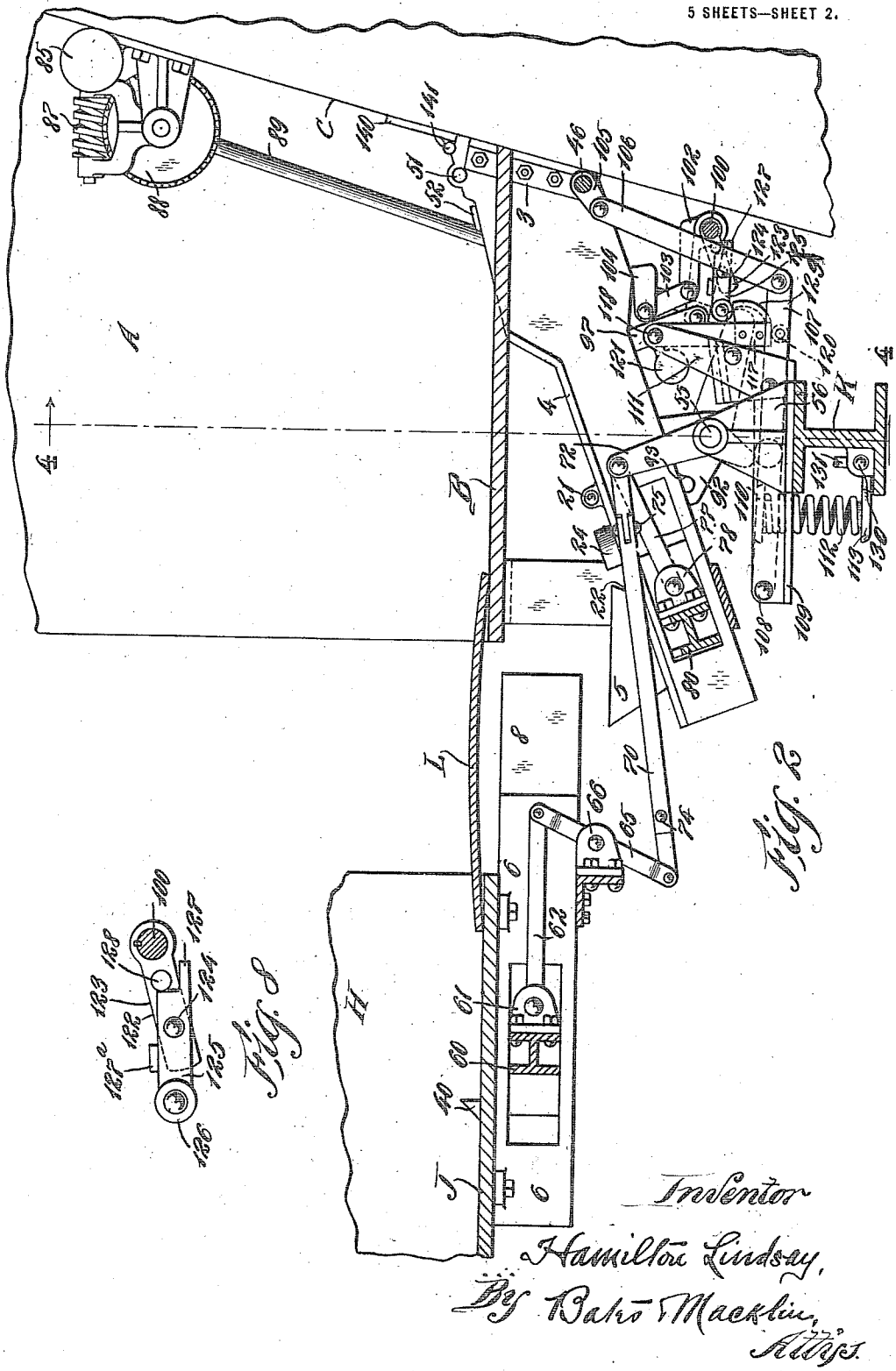

Fig. 2.

Fig. 8.

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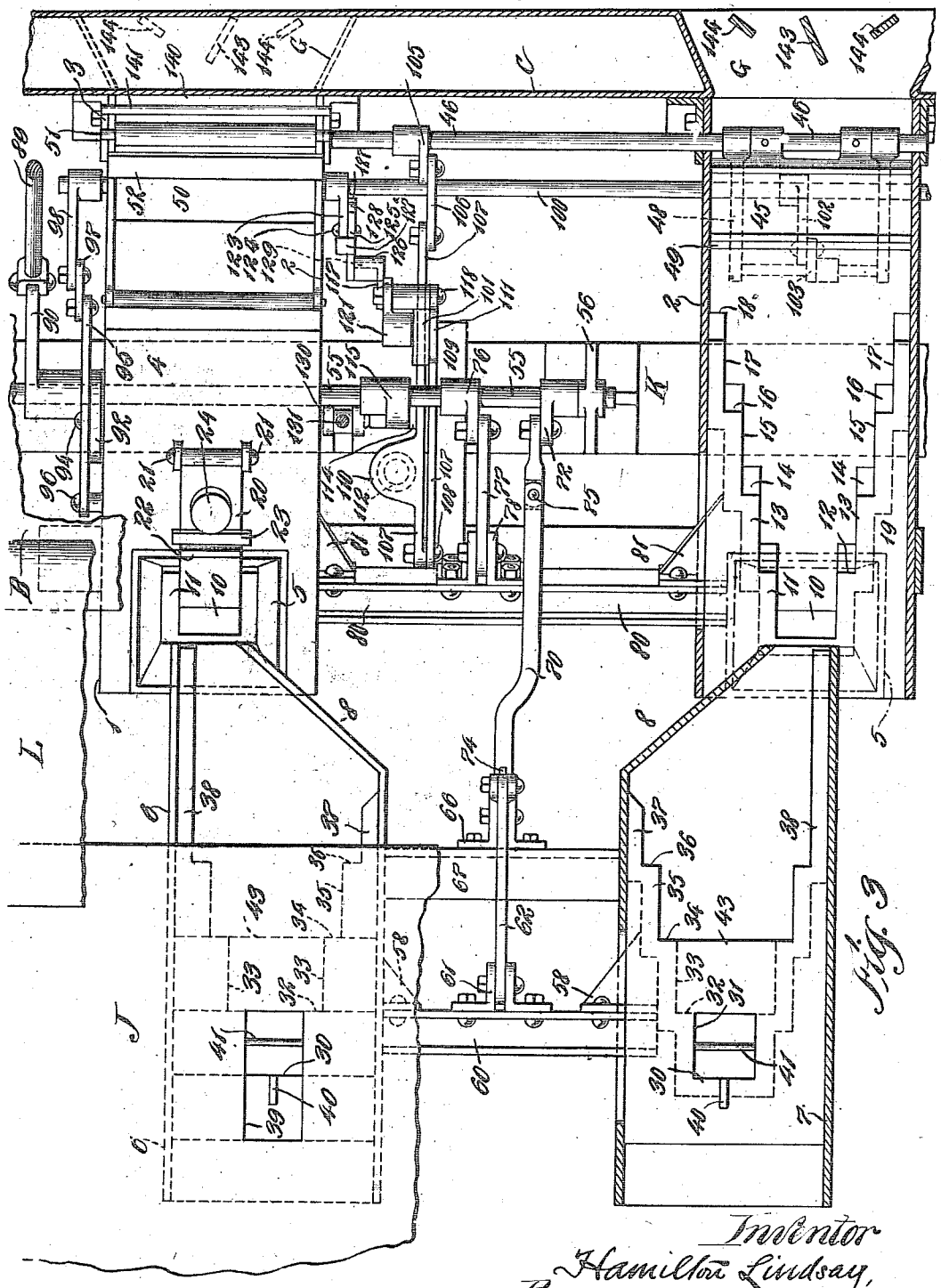

Fig. 3

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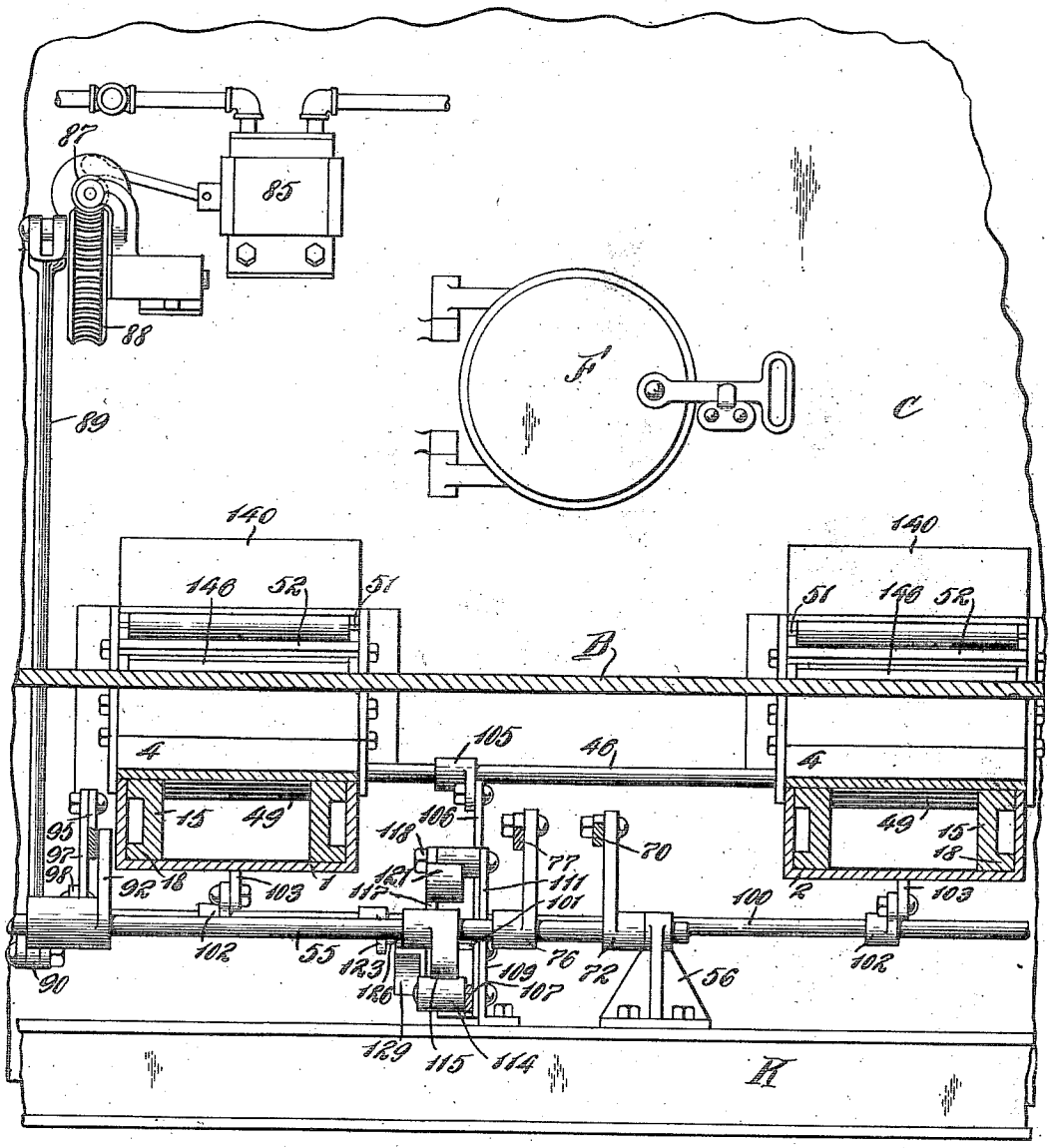

Fig. 4

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5 SHEETS—SHEET 5.

Fig. 5

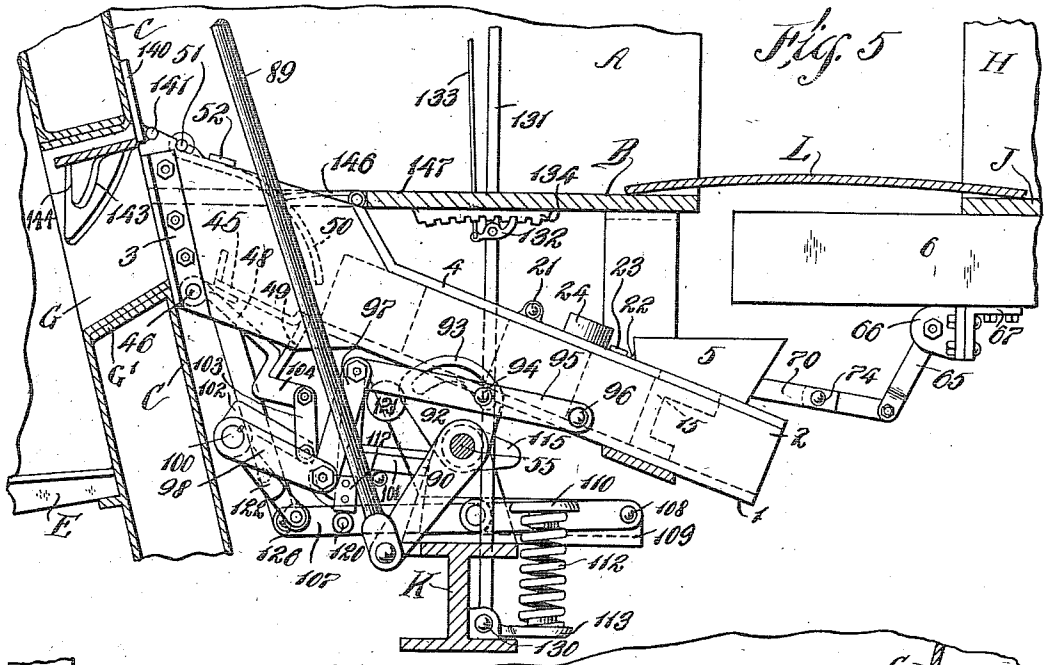
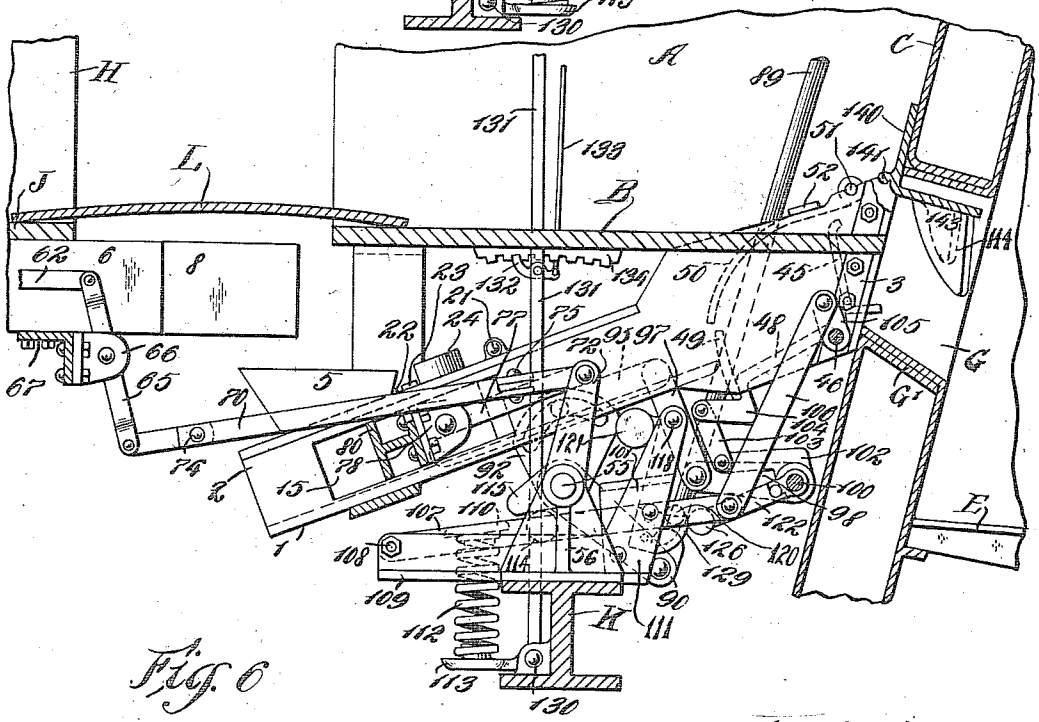


Fig. 6



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UNITED STATES PATENT OFFICE.

HAMILTON LINDSAY, OF WILLOUGHBY, OHIO.

LOCOMOTIVE-STOKER.

1,305,655. Specification of Letters Patent. Patented June 3, 1919.

Application filed October 12, 1917. Serial No. 196,128.

To all whom it may concern:

Be it known that I, HAMILTON LINDSAY, a citizen of the United States, residing at Willoughby, in the county of Lake and State of Ohio, have invented a certain new and useful Improvement in Locomotive-Stokers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to a mechanism adapted to feed coal automatically from a locomotive tender, into the fire box. The general object of this invention is to provide a mechanism for this purpose which shall be simple in construction, efficient in operation and capable of convenient installation on existing types of locomotives and tenders.

One of the objects of the invention is to provide for feeding coal to the fire box substantially continuously in small individual amounts and without opening the fire box space to drafts of cold air. Another object is to cause even spreading of the coal over the fire in the most approved manner by feeding the coal into the fire box with a sudden throwing action, thus attaining a distribution better than that secured by hand shoveling. Another object is to insure regularity in feeding of the desired quantity of coal from the tender to the devices throwing the coal in the fire box and without difficulties resulting from clogging, loss of coal and the like encountered in the usual mechanical stoker for locomotives, such as those heretofore tried.

Another object of the invention is to make the device compact, thus avoiding taking up undue space when installed, and so arranged as to allow mutual play of the locomotive and tender while traveling, as well as permitting convenient uncoupling of them when desired.

The above and more specific objects will become apparent in the following description which refers to the drawings. The essential characteristics of my invention are summarized in the claims.

In the drawings, Figure 1 is a sectional side elevation of my stoker showing the same attached to the locomotive and tender, only the adjacent parts of which are illustrated in the drawing; Fig. 2 is a similar sectional side elevation of the opposite side of the stoker mechanism; Fig. 3 is a plan of the stoker mechanism, the conveyer members at the right of the figure being sectioned to show a construction of the feeding plungers; Fig. 4 is a vertical transverse section through the conveyers on the locomotive looking toward the locomotive and showing the mechanism for operating the throwing blades; Fig. 5 is a section similar to Fig. 1 showing the operating parts in other positions; Fig. 6 is a view of the parts shown in Fig. 5 looking in the opposite direction and illustrating them in the position assumed when the coal is thrown forwardly into the fire box; Fig. 7 is a longitudinal sectional detail through the coal throwing blade and surrounding parts; Fig. 8 is a detail of a trigger operating arm controlling the throwing of the coal.

In the drawings, A indicates a locomotive cab; B the deck; C the inclined end of the boiler, usually comprising spaced apart walls forming a water leg at the rear of the fire box, and E the grate. The rear of the boiler or water leg may be provided with a hand firing opening for use in starting the fire or in emergencies but normally closed by a door F. When my device is used, two separated openings G are provided in the end of the boiler and which slope downwardly near the grate as shown at G'.

Fitted around the openings G, are the forward ends of long box-like chutes extending rearwardly and downwardly beneath the deck B, of the locomotive. These chutes are indicated at 1 and 2 and preferably are made in the nature of cast metal boxes, the side walls of which are enlarged adjacent the fire box and secured thereto by angle brackets 3, each having one flange secured to the box side and the other secured to the boiler plate C'. The chute preferably has its side walls and bottom integral, while being closed for a greater part of its length by a removable plate 4, carrying an upturned hopper 5. Within the housings 1 and 2, are plungers, for conveying the coal forwardly toward the fire box, and means for intermittently throwing a small portion of the coal through the opening G, as will be hereinafter described. The coal is brought from the tender H, along box-like conveyers 6 and 7 secured to the underside of the tender deck J, and extending forwardly therefrom over the hoppers 5. These boxes are also preferably constructed of cast metal and are partially closed at the front ends by transverse wall 8 at the front end, leaving an opening over the hoppers 5.

Within each of the conveyer chutes 1, 2, 6 and 7, are peculiarly shaped plungers ar-

ranged to advance the coal along the same and designed to avoid wedging and clogging thereof. The chutes are machine finished on the interior and open at their rear ends while the front end communicates with the front openings G, whereby I am enabled to fit a cast plunger in the boxes, the removable covers permitting easy assembling. These plungers comprise approximately U-shaped castings, each having a transverse portion 10, at their rear ends, and forwardly extending portions 11 offset at the forward ends as indicated at 12, and integral with the forwardly extending walls 13 which are in turn offset as indicated at 14, the portion 14 being integral with walls 15, which are in turn offset at 16 and integral with forwardly extending walls 17. These portions, 10 to 17 inclusive are vertical inner walls of the plunger and are integral with parallel web portions 18 machine finished on their lower and side surfaces to slidably fit the boxes 1 and 2.

The transverse wall 10 and the shoulders, 12, 14, 16 and 18 form the surfaces which urge the coal forwardly and upwardly along the chutes when the plunger is reciprocated. The coal being admitted adjacent to the wall 10 between the walls 11, as it moves upwardly is allowed to spread laterally, thus entirely avoiding any packing or wedging and consequently rendering the movement of the coal comparatively easy. The shoulders 18 closely meet the side walls of the boxes, while all of the shoulders and walls of the plunger meet the bottom walls and covers and the webs 19 closely fit the bottom and covers, thus preventing even the finest particles of the coal from wedging between the plunger and walls of the chute.

The hoppers 5, receiving the coal from the contracted ends of the chutes 6 and 7, bring the coal to the reduced receiving space of the plunger between the walls 11. To prevent any of the coal in the hopper from catching between the upper portion of the wall 10 and the forward edge of the hopper, I provide a hinged plate 20, pivoted at 21 to the cover 4 and having its rear end rounded inwardly and downwardly so that a piece of coal coming between the wall 10 of the plunger and the rounded portion of this plate at 22, may raise the plate sufficiently to prevent its wedging or breaking any of the parts. The inward movement of the cover is limited by the inward movement of the plate 20, while a weight 24 urges this plate downwardly so that recession of the plunger bringing a wider portion between its walls thereof below this plate 20 may allow the plate to press any lumps downwardly into the mass of coal in the chute. To prevent the coal from moving backwardly with the plunger, I may provide on this plate hinged fingers 25, capable of swinging forwardly, but stopping in the rearward movement in the vertical position. Thus coal may freely pass these fingers on the forward movement but lodges against them on the return of the plunger.

The plungers in the chutes 6 and 7 are substantially the same construction as those just described, each having a rear transverse wall 30, forwardly extending walls 33, which in turn are offset to form shoulders 34 integral with walls 35, offset at their outer ends to form their shoulders 36, integral with parallel extensions 37 and 38. The members 37 are beveled at their forward ends to prevent lumps of coal from wedging between them and the transverse front walls 8 and also to act to force the coal transversely of the chutes along these walls and in front of the extensions 38 which serve to thrust the coal outwardly through the openings at the front end of the chutes from which coal drops into the hoppers 5.

I find that by employing the stepped reciprocating plungers described, in both the locomotive conveyers and the tender conveyers, I can positively feed small amounts of coal and at the same time keep the mass of the coal in the chutes constantly loosened so that it will not clog.

In the deck J, of the tender, are openings preferably substantially twice the length of the movement of the plunger and on the plungers in the boxes 6 and 7 are upwardly projecting fingers 40 adapted to agitate the coal in the tender immediately above these openings, thus causing it to flow freely through these openings and into the restricted portions of the plunger. To prevent large lumps from dropping into the plungers, I may use a transverse bar 41, rigidly secured in the plungers between the walls 31 and at the upper portion thereof, the openings at either side of the bar determining the size of coal fed therethrough. The upper webs 39 of these plungers extend rearwardly far enough to prevent coal dropping behind the plungers.

To avoid coal wedging between the walls and the forward edges of the openings 39, in the tender deck, I find it convenient to extend the horizontal webs of the plunger across the same between the walls 33 as indicated at 43; thus in the plungers, I leave an opening behind the rear edges of the horizontal webs 43, which are at the upper side of the plunger only. The openings 39 are arranged with relation to the plunger so that on the forward movement of the plunger the wall 33 passes just beyond the opening 39, leaving the opening in the plunger in full registration at all times. The forward position of the plunger is indicated in Fig. 3 where this condition is illustrated in connection with the plunger for the chute 6.

Coal moved upwardly along the chutes 1 and 2 comes onto a shovel or throwing blade 45, hinged to a transverse shaft 46, extending through the forward end of the boxes 1 and 2, closely adjacent the wall C. This is a rock shaft which is intermittently rotated through a sufficient number of degrees to move the shovel or throwing blade from the position shown in Fig. 1 to that shown in Fig. 6. The shovel normally rests upon a swinging bracket arm, loosely journaled to the shaft 46 at each side of the connections of the blade 45 to the shaft, as indicated at 48 and extending rearwardly beneath the shovel or blade and carrying at the rear end thereof an upturned flange 49 adapted to stop the progress of coal, when the shovel is moved upwardly to throw its load into the fire box. When the flange 49 is in its up position, it overlaps the lower edge of an arcuate cover plate 50 hinged at 51 to ears formed on the side walls of the boxes 1 and 2. The downward movement of the cover is limited by a strip 50 having its ends overhanging the side walls as indicated at 52. The bracket arms 48 and the throwing blade 45 are moved through their respective arcs at the proper time to accomplish the throwing of coal into the fire box and to allow coal to fill up back of the flange 49, while the blade is absent from the receiving position.

The mechanism for actuating the plungers and for moving the throwing blades and supporting bracket and flange at the proper time will now be described.

Preferably secured to one of the cross beams K of the locomotive frame is a shaft 55 extending transversely beneath the chute 1 and journaled to the beam K by suitable brackets 56. As a means for actuating the two plungers in the chutes 6 and 7 simultaneously, I may connect those plungers with the shaft 55 in the following manner: Projecting from the inner sides of the plungers are brackets 58 integral therewith and extending through openings in the inner side walls of these chutes. Secured to these brackets is the cross member, preferably an I-beam 60, rigidly secured to bracket members number 61. At the forward side of this cross beam is a hinge 60, pivotally connected by a link 70 with an arm 71 rigid on the shaft 55. The link 70 is pivoted at one end to the lever 65 and at the other end to the member 72, and preferably has intermediate joints, indicated at 74 and 75, permitting swinging of the link vertically and horizontally, thus allowing universal play to accommodate the relative movement of the tender and locomotive. The rock shaft 55 carries another upwardly extending arm 76 rigid thereon and pivoted to a shift link 77, in turn pivoted to bracket ears 78 rigid with a cross beam 80, secured to brackets 81, integral with the inner side walls of the plungers. The brackets and ends of the beam 80 operating in longitudinal openings in the inner side walls of the chutes 1 and 2.

It will be seen that the actuation of the rock shaft 55 will cause simultaneous movement of the two sets of plungers, the plungers on the tender moving in one direction while the plungers on the locomotive are moving in the opposite direction.

I prefer also to make the lower portion of the lever 65 longer than the upper portion, or I may provide an adjustment in the arms 72 and 76, to cause the forward plungers to move a greater distance than the plungers on the tender, with the result that the coal can not be fed by the rear plungers fast enough to congest the passages of the forward plungers.

As a convenient means for actuating the shaft 55 and accomplishing the movement of the plungers, as well as the movements of the throwing blades and other parts I have illustrated at 85 a steam engine cylinder having a driving connection with a worm 87 meshing with the worm wheel 88 driving a connecting rod 89 pivoted at its lower end to a rock arm 90 rigid on the shaft 55.

Rigid on the shaft 55, is a face cam having a groove 93, embracing a pin or stud 94 projecting from an arm 95 pivoted as shown at 96 to the side of the plunger box 1. Upon the reciprocation of the shaft 55, the cam 92 is oscillated swinging the lever 95 upwardly and downwardly, which acts through a link 97 pivotally connected to the lever 95 and to an arm 98 on a shaft 100, extending transversely across the face of the inclined end C of the boiler and beneath the forward ends of the chutes 1 and 2. The arm 98 is keyed to the shaft 100, and arms 102, also rigid with the shaft, are connected by links 103, with the projections 104 integral with the bracket arms 48 beneath the throwing blades whereby the oscillation of the rock shaft 100, swings the brackets 48 carrying the stop flanges 49 upwardly to the position shown in Fig. 1.

The means for giving the throwing blades a sudden upward and forward movement is shown as follows: A short arm 105 on the shaft 46 on which the throwing blades are rigidly keyed, is connected by a link 106 with an actuating lever 107 pivoted at 108 to a bracket 109 secured to the transverse I-beam K, of the locomotive. The lever 107 carries a laterally extending cap 110 in which seats one end of a compression spring 112 having its lower end seating in a cap shown at 113. On the shaft 55 is a cam 115 coacting with a roller 114 rigid on the arm 107 to depress that arm and compress the spring 112 to the position shown in Fig. 5 where it is latched. A hinged

strut 117 attached at 118 to a bracket 111 is adapted to bear its lower end against a lug or roller 120 carried on the arm 107, thus holding this arm down with the spring 112 compressed and the throwing blade or shovel 45 in its receiving position. At the same time the arm 95 is actuated by the cam 92 and the connections with the flange stop 49 are so positioned that these stops are lowered, allowing coal to pass across them and onto the throwing blades.

After a predetermined amount of coal has been deposited on the throwing blade by the forward movement of the plunger, the upward movement of the lever 90 actuates the rock shaft 55 to cause the cam 92 to swing the lever 95 upwardly, thus raising the stop flange 49 through the connections described. The actuation of the rock shaft 100 in this movement causes the latch strut 117 to release the lever 107, allowing the spring to thrust its forward end upwardly quickly, which, through the link and arm 106 and 105 respectively, causes the blades 45 to swing upwardly and forwardly sharply, thus throwing the coal forcibly through the opening G. On the discharging or throwing movement of these parts the arm 107 engages a rubber bumper 101 limiting its upward movement while cushioning the blow.

The tripping of the lever 107 by moving the strut 17 off from the roller 120, may be caused by a jointed arm 122 keyed to the shaft 100 and illustrated in detail in Fig. 8. As shown this jointed arm has one member 123 rigid with the shaft 100 and pivoted at 124 to an extension member 125 which carries a roller 126 at its free end, and at the other end has an offset shoulder 127 adapted to engage a stud 128 on the arm 123, limiting its movement in one direction while permitting it to break or flex in the other direction. A lip 127ª on the arm 125 forms an additional stop for the arm 123.

By an upward movement of the jointed arm 122, the roller 126 may engage a cam 129 on the latch 117 to swing the latch rearwardly off from the roller 120, permitting the lever 107 to swing upwardly and actuate the shovels, as described. On the downward movement of the arm 122 the latch 117 is swung forwardly by a weight 121 rigid with the arm; thus the roller 120 engaging this cam on its downward movement is arrested, while the member 123 continues flexing the arm as indicated in Fig. 8 allowing the roller to pass the cam. Thus the cam 115 may depress the lever 107 and the latch may engage the roller 120 to set these parts in a position shown in Fig. 6 and a subsequent downward movement of tripping lever 122 is prevented by its flexing movement from prematurely tripping the mechanism operating the throwing blades.

The lower cap for the spring 112 is shown as pivoted at 130 and rigidly attached to a lever 131, extending upwardly into the cap and having the usual dog 132 operated by a grip handle rod 133 and adapted to engage a rack 134 secured to the cab floor, whereby the lever may be held in various positions, allowing the raising or lowering of the cap 13 to adjust the compression of the spring 112, with a result that distribution of the coal may be regulated somewhat by varying the force applied to the throwing blade.

The openings G into the fire box flare laterally and downwardly. The forward portion of the plunger boxes, fitting over the openings G, preferably stop short of the top of these openings while the upper portions of the openings are closed by a flange 140 having laterally extending trunnions 141 engaging notches, in the side walls of chutes, above the securing angle brackets 3. Integral with the flanges 140 are inwardly projecting flanges 142 which carry downwardly extending tongues 143 and 144. These tongues are preferably arranged at a slight angle to the direction of the coal thrown from the blades 45 so that as coal passes through these openings it is deflected somewhat and thus even distribution is accomplished. The tongues are separated sufficiently to permit some of the coal to be thrown unimpeded to the forward part of the fire box, while the smaller tongues 144 are arranged so that coal impinging thereon, may drop abruptly to the rear end of the fire.

Actual experience has proven that by the described arrangement of flaring openings, throwing shovels and distributing members the coal may be spread according to the best principles of efficient firing, as well as to accommodate the needs of the particular locomotive.

A summary of the operation of my device is as follows: Starting with the plungers in the position shown in Fig. 1, the plungers on the tender are moved to their forward position, causing coal to be thrust forwardly and dropped into the hoppers 5. The subsequent movement of the connecting rod 89, rocks the shaft 55 moving the arms 72 and 76, swinging them forwardly, which advances the plungers on the locomotive and recedes the plungers on the tender, the latter plungers taking a new charge of coal. Assuming that the arm 107 has been depressed and latched on a previous movement of the shaft 55 and cam 115, the finish of the downward movement of the lever 90 causes the plungers to bring the charge of coal onto the throwing blades and the following upward movement of this lever acts through the cam 92, lever 95, hinge 97 and arm 98 to raise the flange stop 49. At the

finish of this raising movement the lever 122 causes its roller 126 to release the latch, allowing the spring 112 to raise its lever, the link 106 and lock arm 105, moving the shaft 46 on which both throwing blades 45 are mounted, thus discharging the coal forcibly through the openings G.

In case any coal lodges between the flange 49 and a cover 50, this cover may swing upwardly without injuring the parts. The opening between this cover and the rear of the opening in the deck, through which the upper portion of the chute projects, may be closed by a hinged cover 146, hinged at 147 to the chute and resting at its forward edge on the cover 50, as shown particularly in Fig. 5.

From the foregoing description it will be seen that I have provided an automobile stoker, comprising a novel plunger arrangement for feeding coal from the tender of the locomotive, not liable to clog or get out of order and capable of movement by use of but little power; and that I have provided a means for throwing and distributing the coal into the fire box in the desired position, actuated by a simple and effective mechanism. My feeding mechanism may operate efficiently with various grades or kinds of coal; thus, I have found that with the embodiment shown in the drawings I can satisfactorily feed coal varying in size from slack to a diameter of four inches.

The apparatus herein shown for conveying coal from the tender to a position where it may be thrown into the fire box forms the subject matter of my application No. 289,742, filed April 12, 1919, for conveying devices for locomotive stokers, and reference is made to that application for claims on such a conveyer.

Having thus described my invention, what I claim is:

1. In a locomotive stoker, a fire box having an opening, a blade opposite said opening, means for oscillating the blade in an upper quadrant to throw coal into the fire box, a plunger conveyer adapted to periodically deposit coal upon said blade, means for operating the conveyer, and means for clearing the path of the swinging edge of said blade preceding the movement of the blade.

2. The combination, with a locomotive and tender, of a throwing blade on the locomotive, means for bringing coal in a column and depositing the forward portion thereof on said blade, an actuating shaft carrying the blade, a spring for turning said shaft on its axis to swing the blade upwardly, a latch device for holding the blade in approximately horizontal receiving position, means for setting and releasing the latch periodically, and positively actuated means for cutting through the column of coal adjacent the swinging edge of the blade.

3. In a locomotive stoker, the combination of a throwing blade, a conveyer for feeding coal upon the blade, mechanism including an actuating spring for moving the blade, a movable support for engaging one end of the spring, a lever for moving said support, and means for latching said lever in various positions.

4. The combination, with a locomotive having a fire box and cab, of a throwing shovel adjacent the fire box, a substantially horizontal shaft carrying the shovel and adapted to be oscillated to bring the shovel to an approximately receiving position, means for quickly moving the shaft to swing the shovel in an upper quadrant to discharge coal on the shovel into the fire box, said means including a lever, a spring acting on the lever, means for setting the spring and latching said lever with the shovel in an approximately receiving position, means operable from the cab to adjust the tension of said spring, and automatic means controlling the latch.

5. The combination, with a locomotive having a cab, of a stoker comprising a supporting and throwing shovel, an actuating shaft carrying the shovel, a spring for turning said shaft to swing the shovel upwardly, a latch for holding the shovel in receiving position, means for setting and releasing the latch periodically, and means accessible within the cab for adjusting the force of the spring.

6. In a locomotive stoker, the combination, with the fire box, of a chute leading thereto, a plunger in said chute, means for bringing coal to the plunger, means for actuating the plunger, a shovel adapted to support coal moved toward the fire box by the plunger and to swing upwardly to discharge the same forcibly into the fire box, a gate adapted to be thrust transversely through the path of the coal between the plunger and shovel, and means for moving the gate to its active position when the shovel is absent from its receiving position.

7. The combination with a fire box, of a receptacle adjacent thereto, a shovel within said receptacle adapted to stand normally approximately horizontal, a conveyer adapted to feed a column of coal the forward end of the column coming onto the top of the shovel, mechanism for cutting through said column at the rear of the shovel and interrupting the feed from the conveyer to the shovel, and mechanism for swinging the shovel upwardly with its load while the feed is interrupted to throw the load into the fire box.

8. In a locomotive stoker, the combination of a supporting shovel, means for bringing the coal from the tender and depositing it on said shovel, an actuating shaft carrying the shovel, a spring for turning said shaft to

swing the shovel upwardly, a latch for holding the shovel in receiving position, means for setting and releasing the latch periodically, and a cushion bumper for receiving the blow when the latch is released.

9. In a locomotive stoker, the combination, with the fire box having an opening flaring laterally, of depending deflectors in the upper portion of such opening, mechanism for feeding the coal from the tender to a point adjacent said opening, a shovel adapted to support coal deposited thereon by such mechanism, and means for periodically giving the shovel a quick movement in an upper quadrant for throwing the coal into the fire box.

10. In a locomotive stoker, the combination, with a fire box, of mechanism for pushing coal in a column to a point adjacent the fire box, a shovel upon which the coal is pushed, and means movable transversely of the column of coal for intercepting the column between the shovel and the pushing mechanism allowing free movement of the shovel.

11. In a locomotive stoker, the combination of a fire box, mechanism for pushing a column of coal to a point adjacent the fire box, a shovel upon which the coal is so pushed, means independent of the shovel for cutting the column closely adjacent the path of the shovel, and means for moving the shovel to forcibly throw the coal into the fire box.

12. In a locomotive stoker, the combination with a fire box, of mechanism including a plunger for moving coal toward the fire box, a supporting shovel adjacent the fire box, upon which the coal is fed by the plunger, a gate, means for projecting the gate across the path of the coal in front of the plunger during its movement away from the fire box, and means for moving the shovel to throw the coal into the fire box while such gate is in active position.

13. In a locomotive stoker, the combination with a fire box and a tender of means for feeding a column of coal from the tender to a point adjacent the fire box, a swinging supporting shovel adapted to receive coal deposited thereon by such mechanism and adapted to be moved to throw the coal into the fire box, and a blade independent of the shovel and positioned adjacent to the free edge of the shovel and adapted to sever said column, and mechanism for positively actuating such blade ahead of the movement of the shovel.

14. In a locomotive stoker, the combination of a conveyer adapted to shove a mass of coal to a point adjacent the fire box and discharge it approximately horizontally, a throwing blade adapted to stand in a substantially horizontal position to receive coal at the forward end of the shoved mass, and a gate adapted to sever such shoved mass closely adjacent to the shovel by moving upwardly across the shoved mass.

15. In a locomotive stoker, the combination of a conveyer for progressing a confined mass of coal to a point adjacent the fire box, said conveyer including a substantially closed chute enlarged vertically at its forward end, an oscillating shovel mounted to lie substantially parallel with the chute and below the forward end of the mass of coal, whereby coal is fed upon said shovel, means for moving said shovel through the path of the coal in an upper quadrant to forcibly discharge the coal thereon into the fire box, the vertical enlargement of the chute allowing such movement of the shovel and allowing the coal to be unconfined on its upper side immediately adjacent the path of the swinging edge of the shovel.

16. In a locomotive stoker, the combination of a conveyer for shoving coal to a point adjacent the fire box, the conveyer including a chute enlarged vertically adjacent to the fire box, a throwing shovel mounted to stand in said enlargement in a position to receive coal at the end of the shoved mass and adapted to swing in an upper quadrant to throw the coal into the fire box, a gate adapted to intercept the coal at the rear edge of the shovel when in its receiving position, and a pivoted arcuate cover mounted at the enlargement and adapted to extend into the chute standing substantially parallel with the swinging edge of the shovel and normally substantially meeting said gate when in its active position.

In testimony whereof, I hereunto affix my signature.

HAMILTON LINDSAY.