No. 646,820. Patented Apr. 3, 1900.

W. FOULIS.

APPARATUS FOR CHARGING RETORTS.

(Application filed Nov. 14, 1899.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

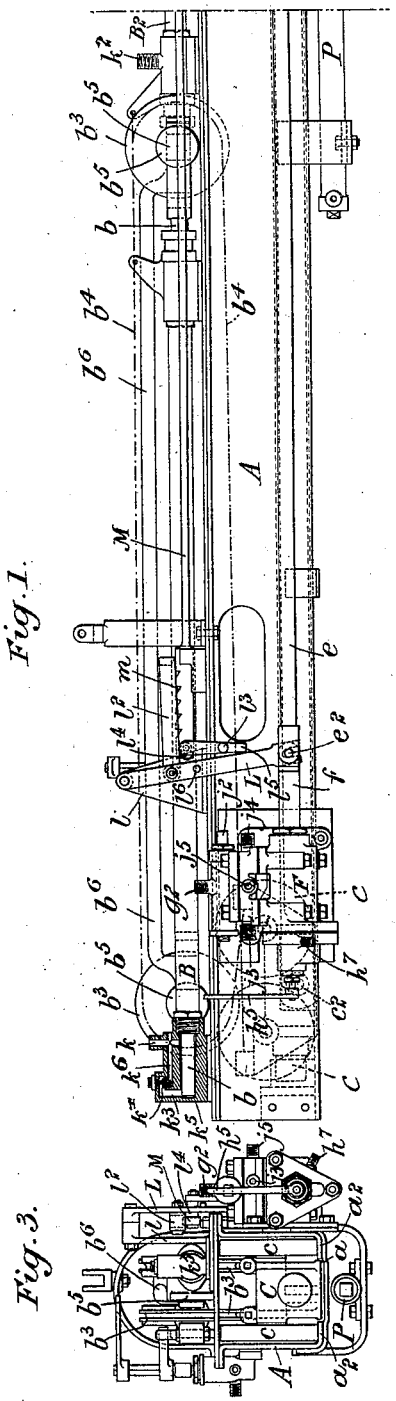


Fig. 2.

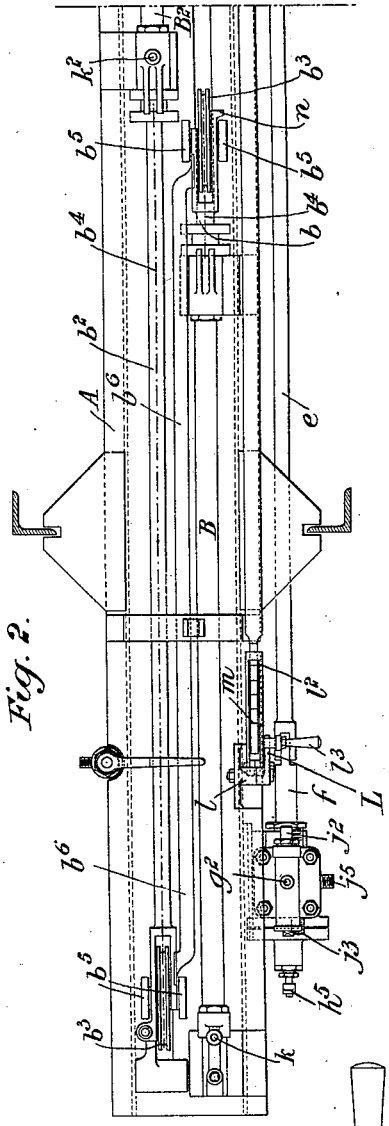
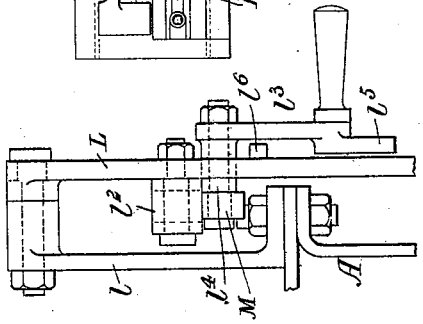


Fig. 3.

Fig. 3a.



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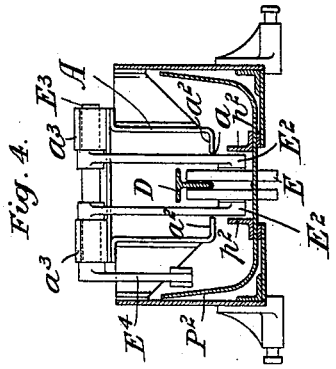

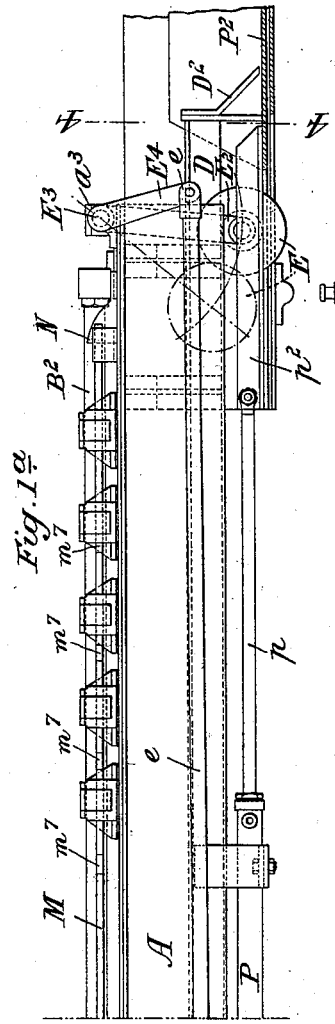

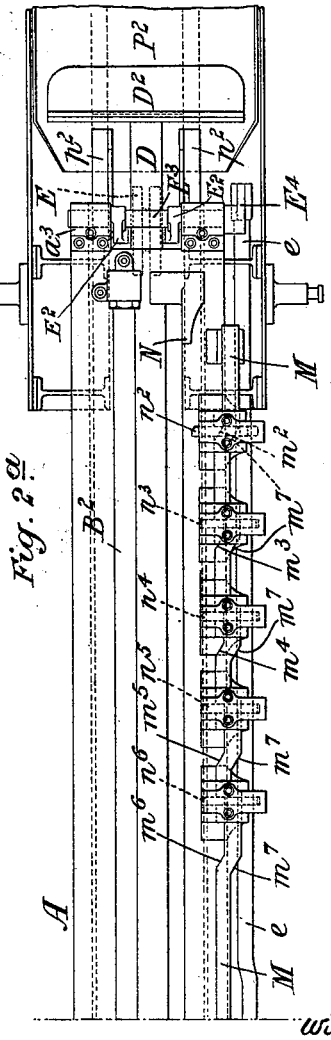

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5 Sheets—Sheet 3.

Fig. 5.

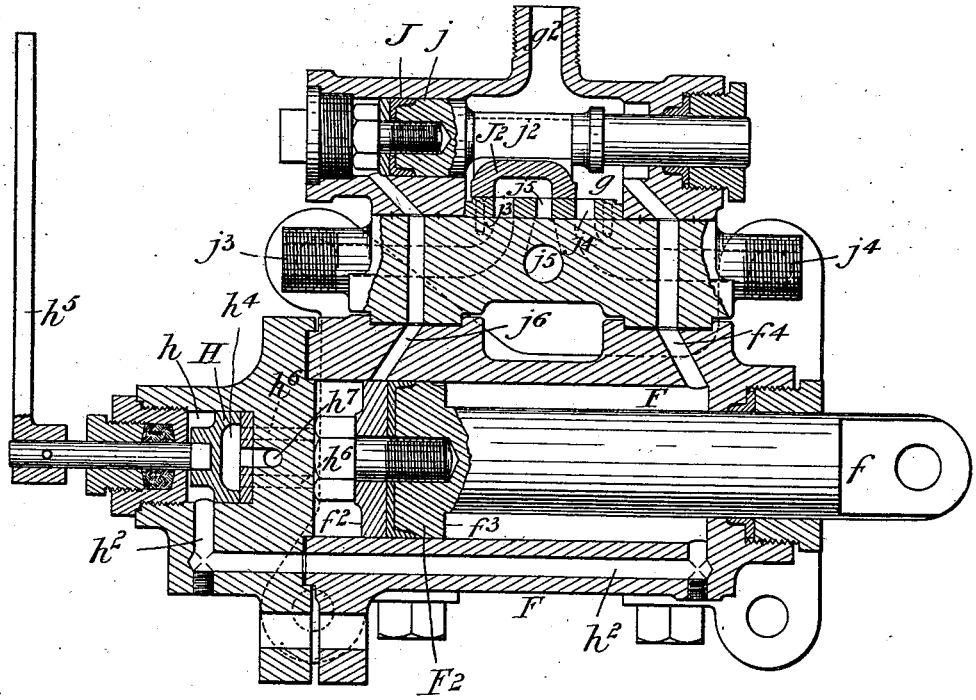

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Fig. 6.

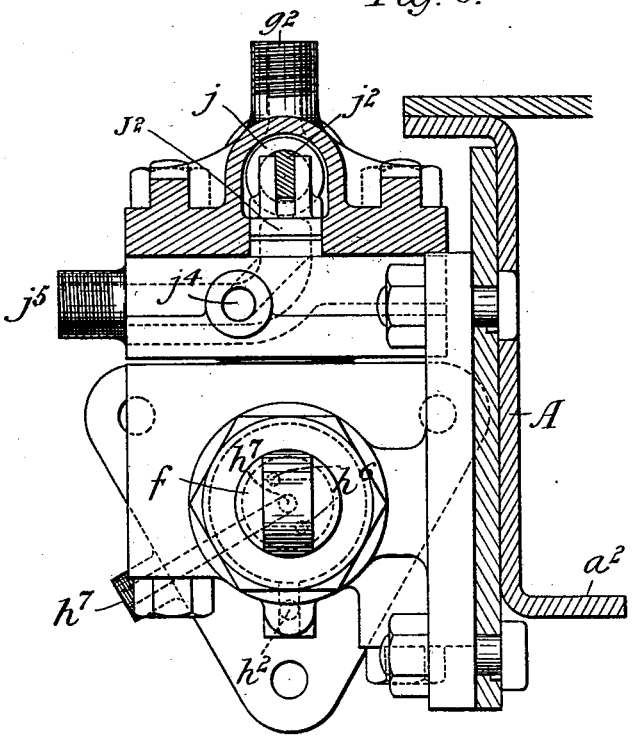

Fig. 7.

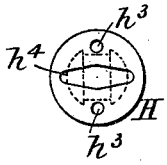

Fig. 8.

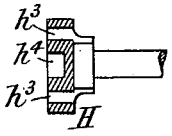

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Fig. 9

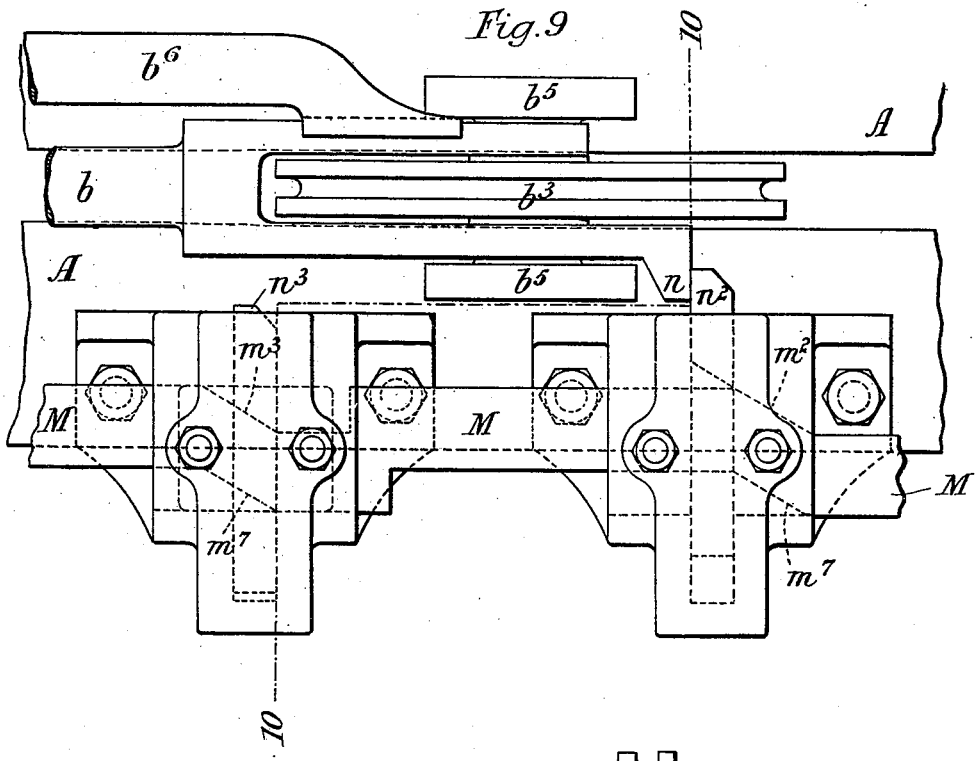
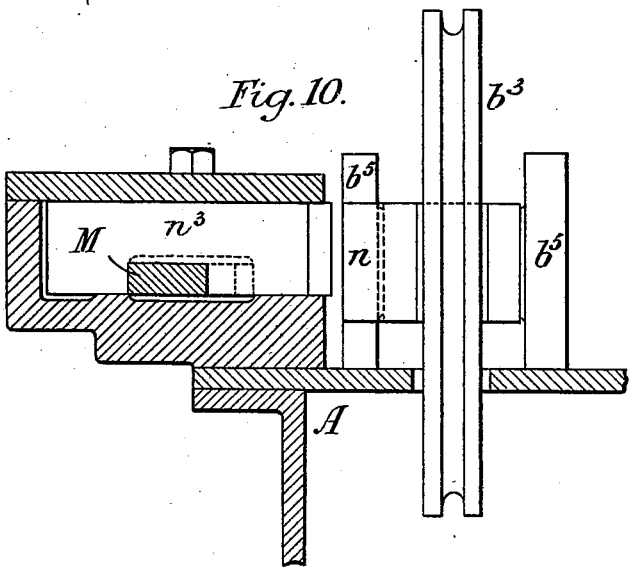


Fig. 10.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CHARGING RETORTS.

SPECIFICATION forming part of Letters Patent No. 646,820, dated April 3, 1900.

Application filed November 14, 1899. Serial No. 736,975. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FOULIS, a subject of the Queen of Great Britain and Ireland, and a resident of 45 John street, in the city of Glasgow, Scotland, have invented certain new and useful Improvements in Apparatus for Charging Retorts and for Stirring and Drawing the Charges Thereof, (for which I have applied for a patent in Great Britain, No. 8,426, dated April 22, 1899,) of which the following is a specification.

This invention relates to apparatus for charging retorts and for stirring and drawing the charges thereof of the class described in United States Patents No. 498,755 and No. 498,779, the objects of the present invention being to improve and simplify the construction of such apparatus and render it more easily operated, more efficient in action, and not liable to readily get out of order.

I will describe my invention by reference to the accompanying drawings, in which—

Figure 1 is the left-hand end, and Fig. 1^a the right-hand end, of the apparatus according to my invention, partly in side elevation and partly in longitudinal vertical section. Figs. 2 and 2^a are similar portions of a plan of the apparatus. Fig. 3 is an elevation of the left-hand end of Fig. 1. Fig. 3^a is a view of a detached portion of Fig. 3. Fig. 4 is a transverse section on the line 4 4 of Fig. 1^a. Fig. 5 is a longitudinal vertical section of a hydraulic cylinder for effecting the raising and lowering of the charge pushing or withdrawing device and the valve for controlling the supply of pressure-water to the main hydraulic cylinders by which the said device is moved longitudinally. Fig. 6 is a view of Fig. 5, partly in end elevation and partly in transverse vertical section. Figs. 7 and 8 are respectively a face view and a vertical section of a detached portion of Fig. 5. Fig. 9 is a plan, and Fig. 10 a transverse section on the line 10 10 of Fig. 9, of part of the apparatus shown in Fig. 2^a. Figs. 3^a and 5 to 10 are drawn to a scale larger than that to which Figs. 1, 2, 3, and 4 are drawn.

Like letters of reference indicate like parts throughout the drawings.

According to this invention I employ a guide or beam A, preferably formed like a hollow girder or of box form in cross-section, with a longitudinal slot a at its under side, this guide or beam being adjustably supported on a movable bogie (not shown in the accompanying drawings) in substantially the manner described in the aforesaid patents. On this guide or beam A are rigidly secured the two hydraulic cylinders B B^2, the movable plungers or rams b b^2 of which, through the pulleys b^3, chains b^4, and carriage C, are caused to impart forward-and-backward longitudinal movement to a rod D. The outer ends of the rams b b^2, rigidly connected together by a bar b^6, are provided with rollers b^5, which travel along the upper surface of the guide or beam A, and the carriage C is mounted on rollers c, Figs. 1 and 3, which travel along ledges or paths a^2 on either side of the before-mentioned longitudinal slot a. By these means the said rams and carriage are capable of being moved along the guide or beam A with a minimum of frictional resistance.

The rod D is preferably of T shape in cross-section and at one end is pivoted at c^2, Fig. 1, to the carriage C, and near its other end, where it carries a rake or pusher D^2 or like device, it passes over a roller or pulley E, preferably grooved to fit said rod, as shown in Fig. 4. The roller or pulley E is journaled in the free ends of two lever-arms E^2, whose upper ends are rigidly secured to a cross-shaft E^3, mounted in bearings a^3 on the guide or beam A, the said shaft having also secured to it a lever-arm E^4, to which is pivoted a rod e, operated by the piston-rod f of a hydraulic cylinder F, secured to one side of the guide or beam A. The piston F^2 of the hydraulic cylinder F, as shown in Fig. 5, is made so as to present a larger surface to the pressure-water at its rearward face f^2 than it does at its forward face f^3, and the pressure-water is constantly in communication with the space in the cylinder F forward of the piston F^2, this part of the cylinder communicating with the source of pressure-supply through the port or passage f^4, valve-chamber g, and inlet g^2. A valve H (preferably a rotary valve, as shown) is provided in a valve-chamber h, with which the pressure-water has constant communication through a passage h^2, leading from the forward end of the cylinder F to the part of the chamber h at the rear of the valve H.

The valve H is provided with two ports h^3 and a recess h^4 and can be rotated by a hand-lever h^5, so as to bring the said ports h^3 into register with two ports h^6, (shown in dotted lines in Figs. 5 and 6,) and thereby admit pressure-water to the back of the piston F^2 or bring the recess h^4 over the ports h^6, so as to place these ports in communication with the exhaust-outlet h^7, in which latter position the pressure on the forward face of the piston forces the said piston into its most rearward position. When pressure-water is admitted at the rear of the piston F^2, the said piston is caused to move forward, owing to the area of the rear face of the piston being larger than that exposed to the pressure-water at the forward side thereof. When the piston F^2 is moved backward, it (through the piston-rod f, connecting-rod e, lever-arms E^4 E^2, and cross-shaft E^3) also draws the roller or pulley E backward from the position in which it is shown in full lines to that in which it is shown in dotted lines in Fig. 1ª, so that the operative end of the rod D and the raking, pushing, or other device thereon are raised by the said roller or pulley. When this roller or pulley is in its lowest position, the lever-arms E^2 are perpendicular or almost perpendicular to the rod D, and therefore the leverage exerted through the lever-arms E^2 E^4 to raise the rod D and its attachments is considerably greater during the first portion of the movement (when it requires more power to raise it) than it is during the latter portion of the movement.

In connection with the cylinder F, I prefer to provide a cylinder J, having a piston j, which, like the before-described piston F^2, has a larger operative area at its rearward side than at its forward side, so that when pressure-water is admitted to the rear of the piston j greater pressure will be exerted on the rearward face than on the forward face, and consequently the said piston will be moved forward. The piston-rod j^2 operates a slide-valve J^2, which through the ports j^3 j^4 j^5 controls the passage of water to and from the before-mentioned cylinders B B^2, and when the apparatus is employed for charging retorts the said ports are connected as follows: The port j^3 is connected to the inlet k of the hydraulic cylinder B, the function of which is to propel the rod D and its attachments forward into the retort, the port j^4 is connected to the inlet k^2 of the hydraulic cylinder B^2, whose function is to withdraw the rod D from the retort, and the port j^5 is connected to the exhaust or sump, from which the water is pumped into the accumulator. The port or passage j^6, through which the pressure-water passes to the rear of the piston j from the cylinder F, is closed by the piston F^2 when the latter is in its most rearward position, as shown in Fig. 5, the said port or passage being opened early in the forward stroke of the piston F^2, so that the piston j may also be moved forward to move the slide-valve J^2 from over the port j^3, through which the pressure-water then passes into the cylinder B, the cylinder B^2 at this time being open to exhaust, by which operation the grooved roller E and rod D are lowered and at the same time the said rod is forced forward into the retort. When by turning the valve H the pressure is released from the back of the pistons F^2 and j, the pressure on the forward faces of the said pistons causes them to travel backward, so that the grooved roller E and rod D are raised, and pressure-water being admitted to the cylinder B^2 the rod is at the same time withdrawn from the retort.

When the apparatus is employed for drawing retorts, the connections between the hydraulic cylinders B B^2 and the valve-ports j^3 j^4 are the reverse of those herein last described, so that the roller E, carrying the rake-rod D, is in its highest position when the rod D is being pushed into the retort and in its lowest position when it is being withdrawn from the retort.

When the apparatus is employed for charging retorts, the stroke of the rod D and pusher D^2 has to be less at each succeeding stroke, as the first charge has to be pushed to the far end of the retort, the next charge to a position farther forward in the retort, and so on until the retort is sufficiently charged. In order to effect this, I provide a lever L, the upper end of which is pivoted to a bracket l, rigidly secured on the guide or beam A, and the lower end is forked and engages with the pin e^2, by which the rod e and piston-rod f are joined together. To the lever L is pivoted a pawl l^2, which engages with teeth m on the rear end of a rod M, the said teeth being formed at distances apart corresponding with the stroke of the pawl. The rod M at its forward end is provided with inclines m^2 m^3 m^4 m^5 m^6, which are arranged so as to successively act upon stops n^2 n^3 n^4 n^5 n^6 to project them in the requisite order to stop the pusher D^2 when it has completed its strokes of the particular length required. A detached part of this mechanism is shown in Figs. 9 and 10. The forward end of the ram b is provided with a projection n, which at the end of the first forward stroke of the said ram and pusher D^2 is stopped by a fixed stop N. At the return stroke of the pusher D^2 and corresponding backward stroke of the grooved roller E and rod e the pawl l^2 is moved backward, so as to be in a position to engage with the first of the rack-teeth m. At the next forward stroke of the rod e and ram b the pawl l^2 engages with the first of the rack-teeth m and through the incline m^2, as shown in Fig. 2ª, forces the stop n^2 into the path of the projection n, so that the forward movement of the pusher D^2 will be stopped when, as shown in Fig. 9, the said projection n strikes the stop n^2. At the next forward stroke of the rod e and ram b the pawl l^2, by engaging with the second of the rack-teeth m and through the incline m^3, forces the stop n^3

into its operative position and stops the pusher D^2 in the retort at a point farther forward than that determined previously by the stop n^2. By the engagement of the pawl l^2 with the third of the rack-teeth m the stop n^4 will be moved into its operative position and the forward travel of the pusher D^2 will be correspondingly limited, and so with the other of the stops, each of which stops the pusher D^2 at a point short of that allowed by the stop last previously brought into operation.

The rod M has pivoted to it a handle l^3, by which it may be drawn back into its starting position, and it is provided with a series of inclines m^7, so that when thus drawn back it will successively withdraw all the stops n^6, n^5, n^4, n^3, and n^2 into their inoperative positions ready for the next charging operation. The pivoted handle l^3 is provided with a cam l^4, which when used for moving the rod M, as last described, lifts the pawl l^2 out of engagement with the rack-teeth m, and it is also provided with a projection l^5, Fig. 3^a, which rests on a stud or stop l^6 on the lever L and holds up the handle l^3, and consequently the pawl l^2, until the commencement of the first stroke of the next charging operation.

When the apparatus is used for stirring or drawing the charges of retorts, the last-described stopping mechanism is dispensed with.

The hydraulic cylinders B and B^2 are preferably provided with a cushioning arrangement which confines a certain amount of water in one of the said cylinders at the rear of the ram thereof, so as to prevent shock at the termination of the rearward movement of the rams. This arrangement, as shown in Fig. 1, consists of a passage k^6, having a branch k^3, opening into the extreme rear end of the cylinder B, and a branch k, opening into the cylinder B at a short distance in advance of the rear end, a valve k^4 being arranged between the two branches, which closes the passage for water in the direction from the branch k^3 to the branch k, but allows of the free passage of incoming water through the branch k^3. When the ram b approaches the end of its back stroke and after it passes the forward branch k, water is confined between its rear end and the end k^5 of the cylinder and can only pass slowly between the ram and cylinder or by a restricted passage provided for the purpose; but when water is admitted through the inlet k it can pass through the passage k^6, lift the valve k^4, and enter the cylinder B by way of the branch k^3, and thus force the ram b forward.

As shown in Figs. 1 and 1^a, I prefer to employ a hydraulic cylinder P for moving backward and forward the plate or chute P^2, which communicates between the machine and the retort, the said plate or chute P^2 being connected to the ram p by a yoke p^2, which latter admits of the grooved roller E working freely between its two arms.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

1. In apparatus for charging retorts, and for drawing the charges thereof the combination with a guide, or beam, a rod carrying a charge pushing, or withdrawing device, longitudinally movable on the guide or beam and motor mechanism such as hydraulic cylinders and rams for imparting such movement to the rod, of motor mechanism for raising and lowering the said rod independently of the guide or beam substantially as set forth.

2. In apparatus for charging retorts or for drawing the charges thereof the combination with a guide or beam, a rod carrying a charging or withdrawing device longitudinally movable on the said guide or beam and motor mechanism such as hydraulic cylinders and rams for imparting such movement to the rod, of a roller supporting the rod, lever-arms carrying the roller, and motor mechanism for swinging the lever-arms on their pivot substantially as set forth.

3. In apparatus for charging retorts or for stirring or drawing the charges thereof, the combination of a hollow guide or beam in box form in cross-section, a rod carrying or constituting a charge-actuating device longitudinally movable in the said guide or beam, a carriage mounted on rollers adapted to run on paths within the guide or beam, and connected to the rod, hydraulic cylinders and rams for imparting longitudinal movement to the carriage, and rollers on the rams running on the guide or beam substantially as set forth.

4. In apparatus for charging retorts or for drawing the charges thereof, the combination with a guide or beam, a rod carrying a charging or withdrawing device longitudinally movable on the said guide or beam, motor mechanism for imparting such movement to the rod, a roller supporting the rod and lever-arms carrying the roller, of a hydraulic motor, substantially as set forth.

5. In apparatus for charging retorts, the combination with a frame or beam, a pusher-rod longitudinally movable thereon and motor mechanism such as hydraulic cylinders and rams for imparting such movement to the pusher-rod, of motor mechanism for raising and lowering the pusher-rod independently of the frame or beam, and stops operated by the said motor mechanism for limiting the longitudinal movement of the pusher-bar substantially as set forth.

6. In apparatus for charging retorts, the combination with a guide or beam, a pusher-rod longitudinally movable thereon, and motor mechanism such as hydraulic cylinders for imparting such movement to the pusher-rod, of a rod having inclines, rack-and-pawl mechanism for moving the said rod longitudinally step by step, motor mechanism for imparting said movement to the rod and stops

arranged on the frame or beam operated successively by the inclines on the said rod for limiting the movement of the pusher-rod substantially as set forth.

7. In apparatus for charging retorts the combination with a longitudinally-movable pusher-rod, a rod having inclines, stops operated by such inclines for limiting the movement of the pusher-rod and rack-and-pawl and motor mechanism for moving the rod, of a handle for returning the rack to its starting position, a cam on or in connection with the handle for raising the pawl, and means for temporarily supporting the handle and thereby the pawl substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM FOULIS.

Witnesses:

JOHN CHARLES EDWIN CHAPMAN,

JOHN SMITH.