H. HENDERSON.

MOLD RAMMING APPARATUS.

APPLICATION FILED APR. 28, 1908.

931,201. Patented Aug. 17, 1909.

4 SHEETS—SHEET 1.

Fig. 1.

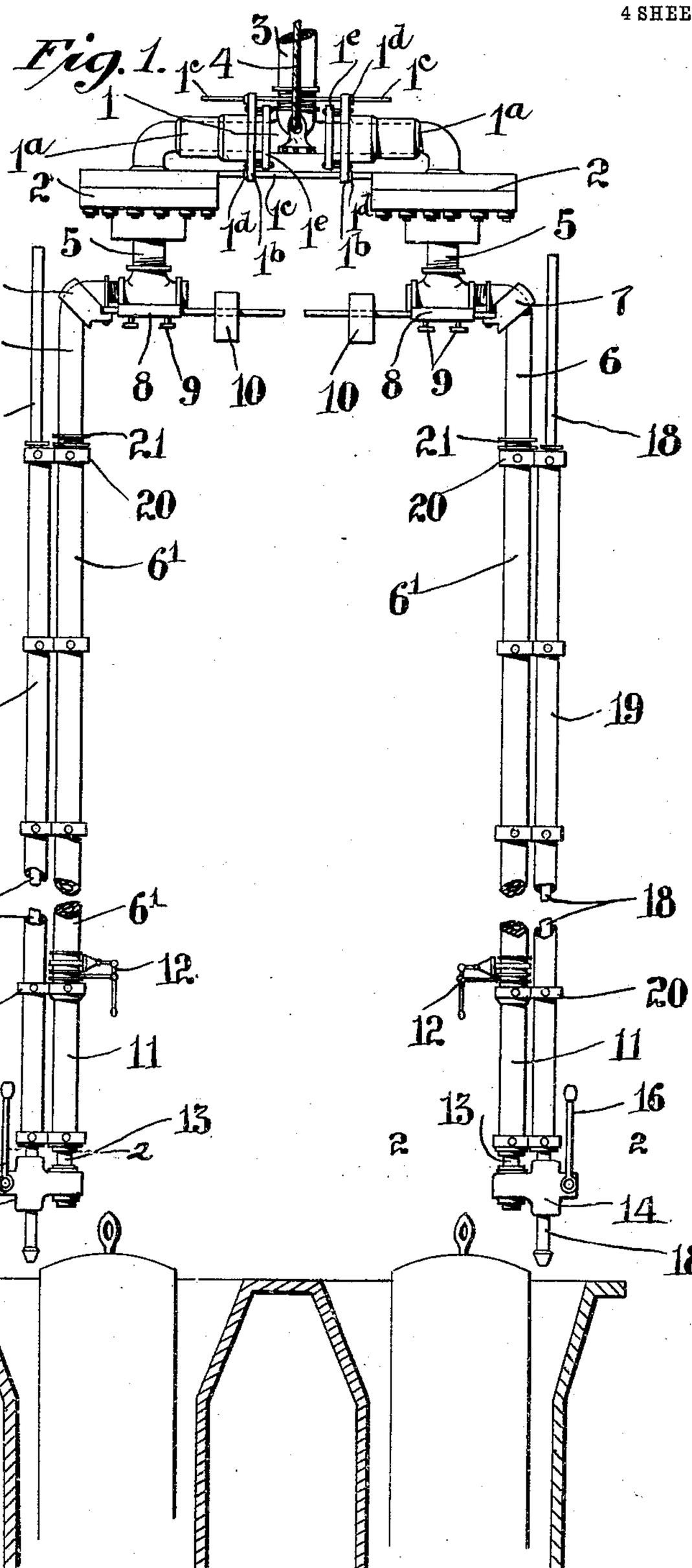
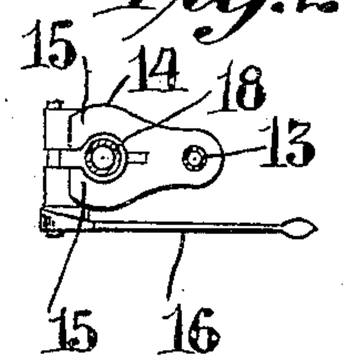


Fig. 2.



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4 SHEETS—SHEET 2.

Fig. 3.

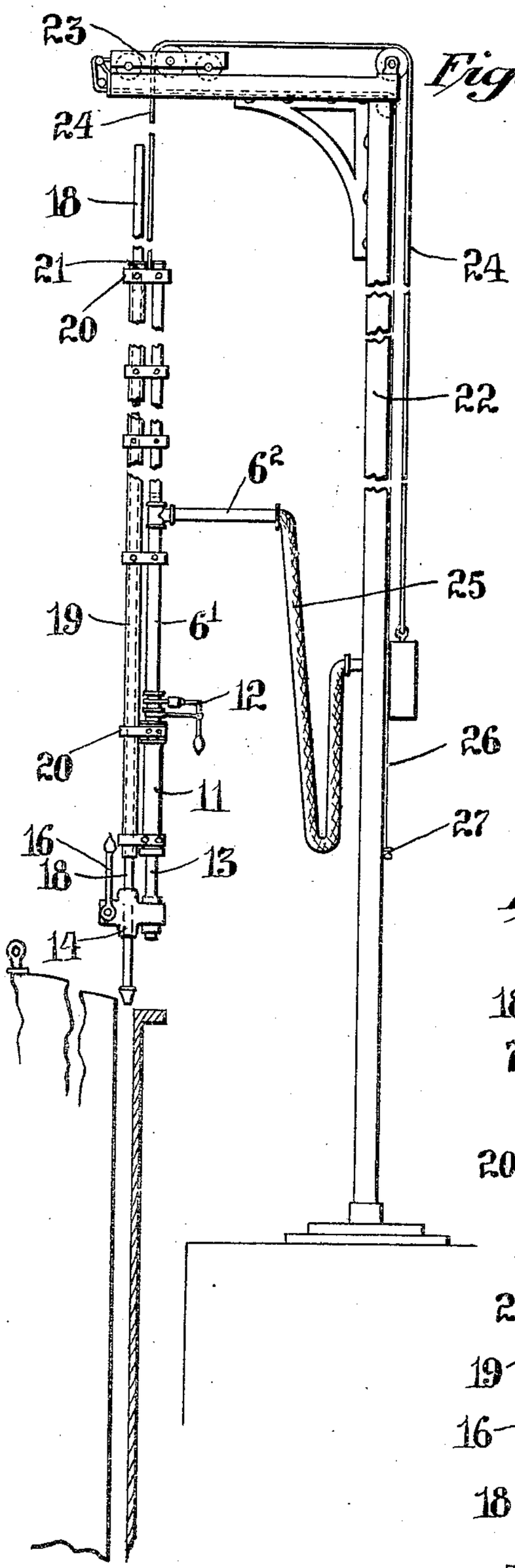


Fig. 4.

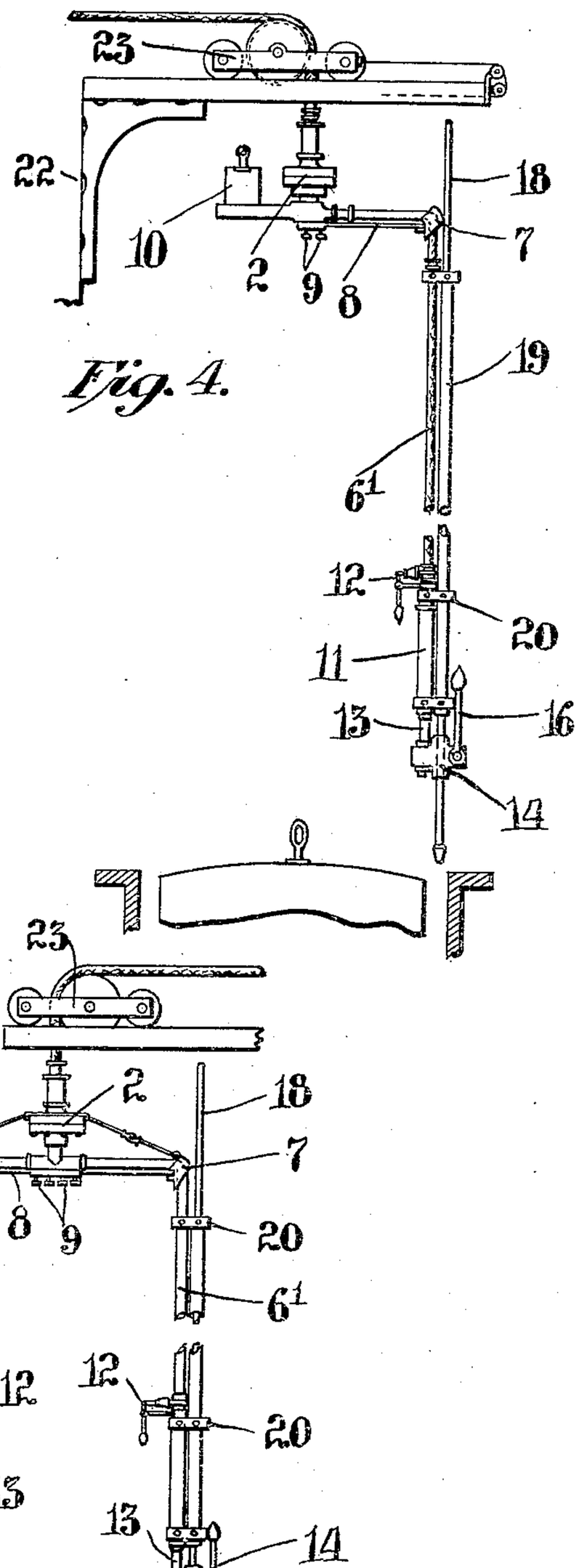
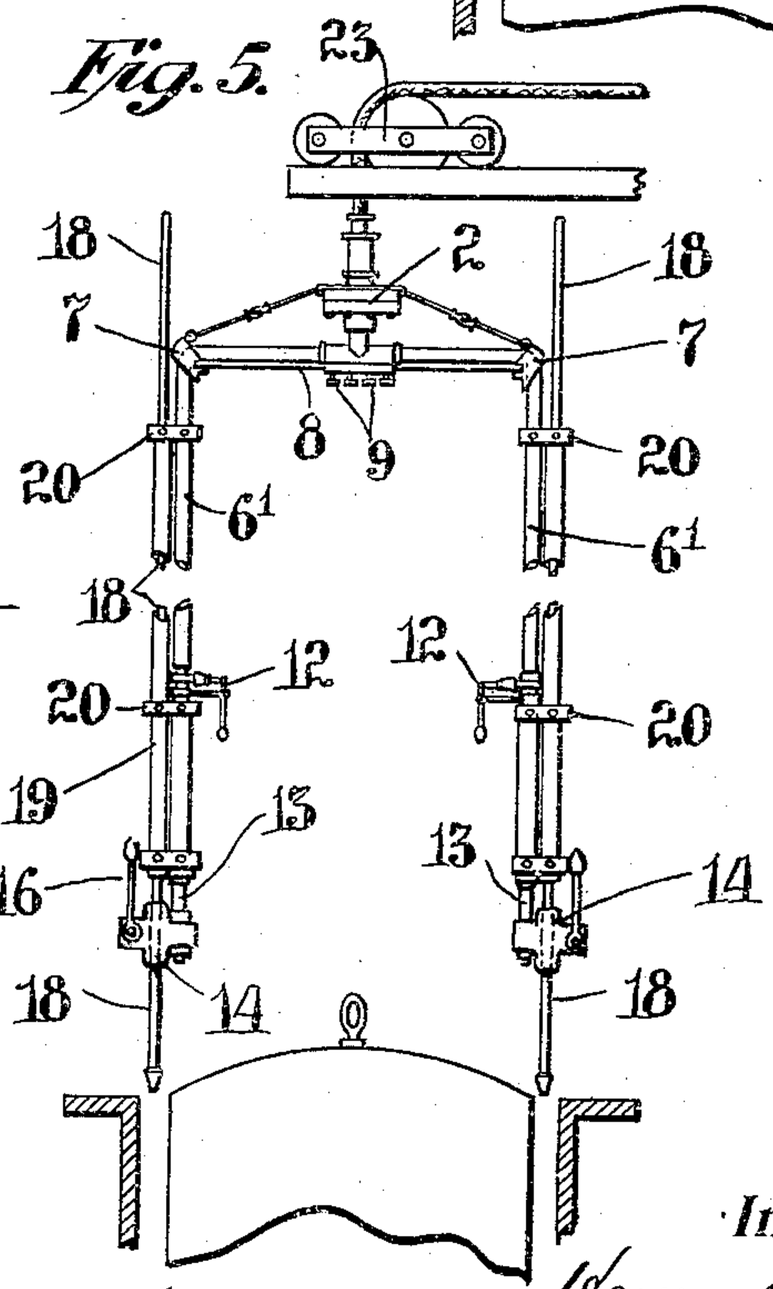


Fig. 5.



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4 SHEETS—SHEET 3.

Fig. 6.

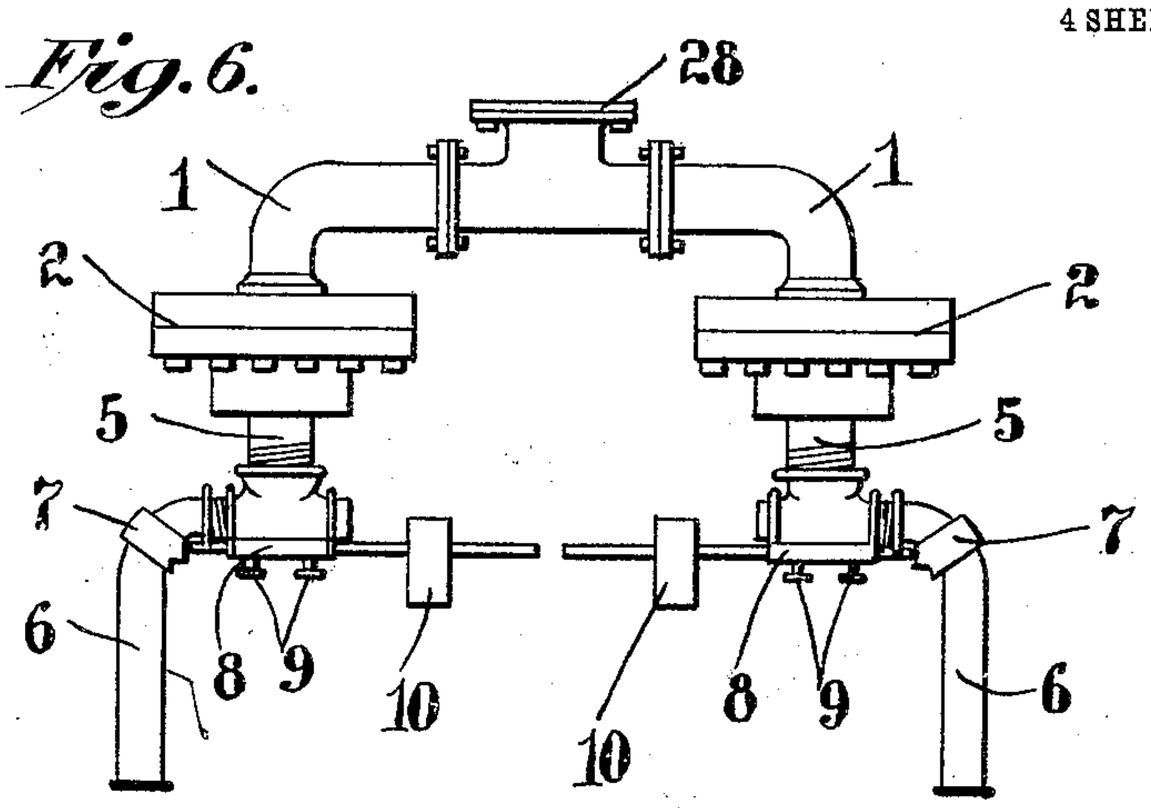


Fig. 8.

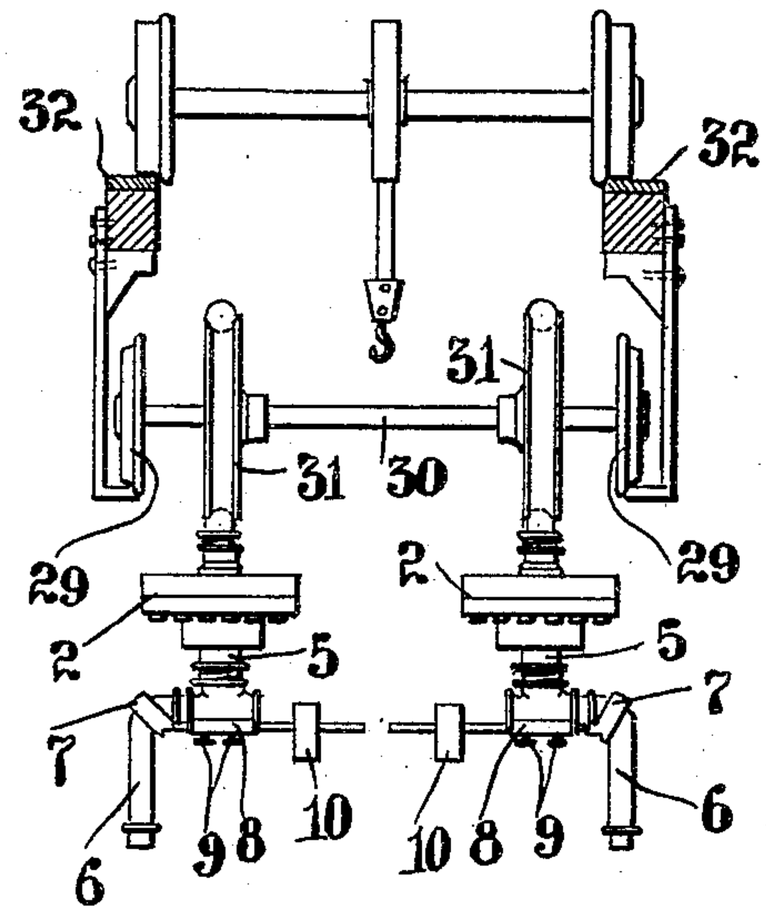
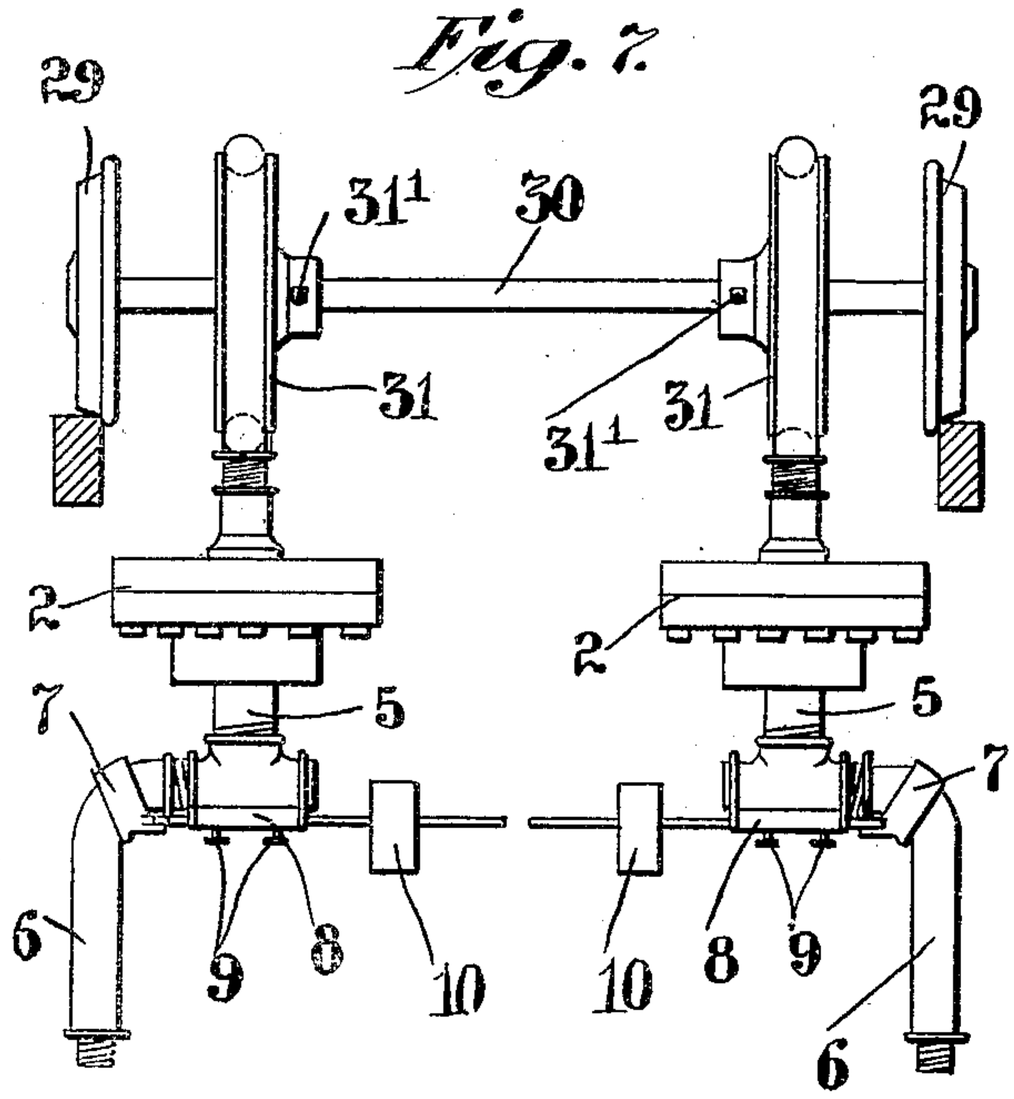


Fig. 7.



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4 SHEETS—SHEET 4.

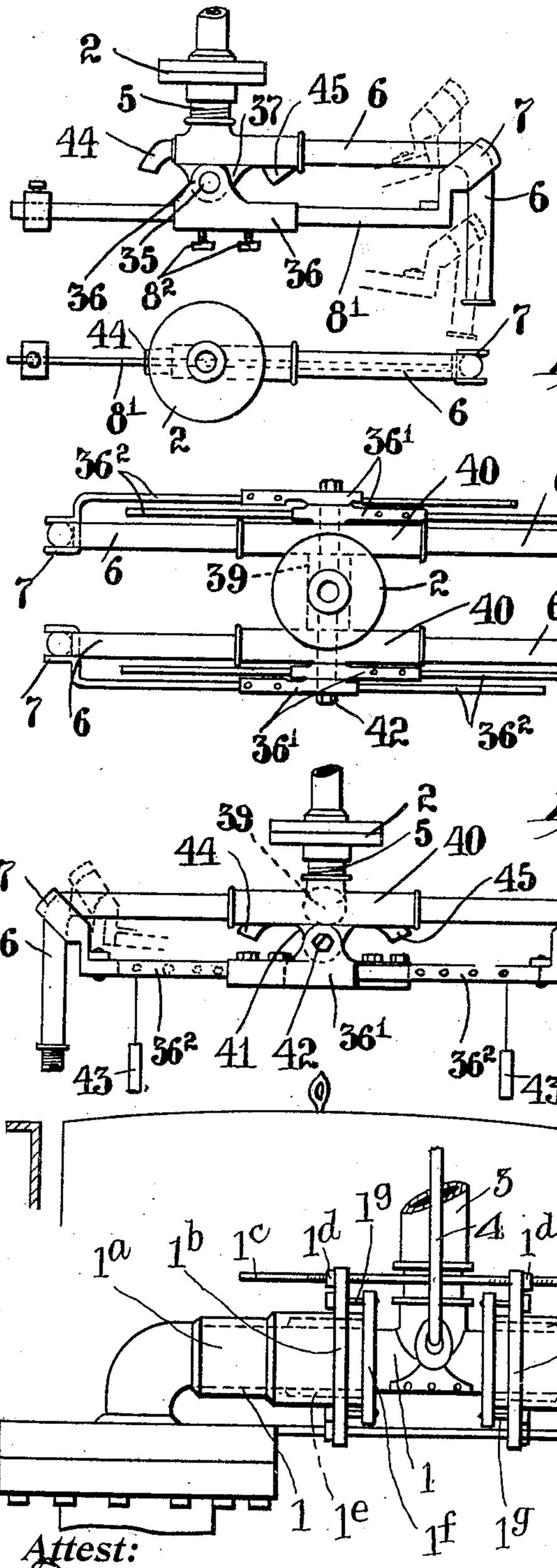

Fig. 9.

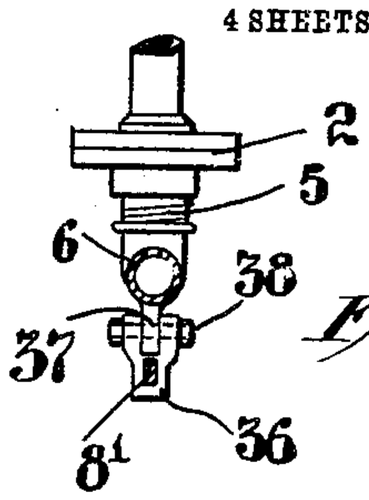

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 1ª.

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UNITED STATES PATENT OFFICE.

HENRY HENDERSON, OF NEW YORK, N. Y.

MOLD-RAMMING APPARATUS.

No. 931,201. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed April 28, 1908. Serial No. 429,680.

To all whom it may concern:

Be it known that I, HENRY HENDERSON, a citizen of the United States of America, residing in the borough of Manhattan, city, county, and State of New York, have invented certain Improved Mold-Ramming Apparatus, of which the following is a specification.

This invention relates generally to a style of mold ramming apparatus of which an example is disclosed in my U. S. Patent No. 876,054 of January 7, 1908. There is a rammer shaft and its actuating power device carried above the mold cavity. Preferably the suspending means is capable of adjustment to molds of different radius.

A primary feature of the invention is that the rammer shaft is adjustably connected with the pitman or power reciprocated part, so that when lower portions of the mold have been rammed, the rammer shaft may be released, the cylinder lowered and the two again firmly connected. The power driven device may be of any suitable character. It may be a double acting reciprocating cylinder motor to be supplied with a fluid, as air, under pressure; or it may be of any other character adapted to operate to effect ramming of the mold in the general manner indicated and the particular construction and character or style of such apparatus may therefore vary according to the preference of the designer.

Other features of this invention are hereinafter set forth.

In the accompanying drawings Figure 1 is an elevation partly in section of one form of apparatus for simultaneously ramming double molds: Fig. 1ª is an enlarged elevation of the upper part of Fig. 1. Fig. 2, a detail cross section on the line 2, 2, of Fig. 1: Fig. 3, an elevation showing a somewhat different arrangement of apparatus for use in ramming rotating single flasks: Figs. 4 and 5 are respectively similar views showing still other arrangements for use in ramming stationary single and revolving flasks: Fig. 6, a detail elevation showing a special form of means for rigid suspension of the apparatus and for supplying them with fluid under pressure: Fig. 7 is an elevation showing a way of carrying the rammer supporting means and for suspending the same from horizontally adjustable trucks: Fig. 8, a like view showing the rammer apparatus carried by a truck running on tracks arranged under those of an ordinary jib carriage or traveling crane: Fig. 9 is a side elevation: Fig. 10 an end view, and Fig. 11, a plan view showing a means for adjusting the radius of a vertically disposed rammer device to adapt it to molds of different radius, and for balancing it and affording flexibility or play, irrespective of the idea of changing the radius of its point of support. Figs. 12, 13 and 14 are respectively a plan, side elevation and end view of an organization comprising a plurality of ramming devices suspended from a single point of support and each provided with means for independent adjustment of the radius of its point of support, and for balancing same and affording flexibility or play.

In Fig. 1 is shown a hollow cross head 1 in each of the downturned end portions 1ª of which is secured a swiveling rammer support 2 that may be of the general construction and arrangement disclosed in my prior patent above mentioned. Air, for instance, under pressure is supplied to the cross head 1 by pipe or hose 3 and the cross head may be suspended by a cable 4, that carries the weight of the apparatus, and is counterbalanced so that the cross head 1 may be raised or lowered by the workman, or workmen, manipulating the apparatus.

The details of construction of the cross-head are shown in Fig. 1ª. Over the ends of the central part 1 slip the upper ends of the parts 1ª whose flanges 1ᵇ are connected by threaded rods 1ᶜ to which are applied nuts 1ᵈ. Packing glands 1ᵉ are applied to the joints and the screw-bolts 1ᵍ connect the flanges 1ᶠ of the glands with the flanges 1ᵇ. By this construction or in other appropriate ways, the distance between the centers of the swiveling heads 2 may readily be adjusted to adapt the apparatus to flasks of different sizes. Each swiveling support has a hollow downward projection 5 to a lateral opening of which may be connected a flexible armored hose or tube 6 which passes over and is supported by the forked end 7 of a horizontal disposed arm 8 adjustably attached by set screws 9 to the bottom of the extension 5 so as to afford adjustment of the radius of the point of suspension of the hose. The arm 8 is extended at the other end to receive an adjustable counter-weight 10. The hose 6 carries at its free end a double acting cylinder 11 of which 12 is the controlling valve. The lower projecting

end 13 of the piston rod is preferably enlarged and has rigidly secured to it a horizontally disposed clamp 14 that may be made as indicated in Fig. 2,—*i. e.* in the form of a split block having two spring yielding jaws 15, 15, connected by a bolt about which rocks a lever 16 having a cam faced hub that works against a cam face on one of the jaws. When the lever arm 16 is horizontally disposed the jaws spring apart but when turned vertically they are clamped upon and rigidly secure a rammer shaft 18, reciprocating vertically in a tube 19 attached to the armored hose by suitable couplings 20. The part I have called an armored hose may be in part a rigid pipe. For instance, a coupling 21 may connect to the end of the flexible part 6 a metal pipe 6′ carrying at its lower end the double acting power cylinder 11. Such a cylinder for ramming molds is well known and other power devices for that purpose have been proposed. It is immaterial what may be the character of the power device and what may be the details of the other mechanical construction of the apparatus provided the operation comprised in this invention is present.

The point of suspension or support of cable 4 may be, as provided in my above mentioned patent, adjustable radially as well as in a horizontal arc around a post or column and the cable may be raised and lowered to determine the relation of the piston and the power cylinder to the top of the mold. In the instance depicted in Fig. 1, there is shown a double mold, *i. e.* one having two patterns. Each of the power devices shown may be adjusted with reference to the pattern of one of the molds and the radius of each with reference to the vertical axis of its swiveling support may be such that the device may be revolved above the mold cavity.

In the beginning of the operation of ramming the sand at the bottom of the mold, the lever arm 16 may be moved into horizontal position and the rammer shaft will drop through the clamp or coupling block 15 into proper relation to the bottom of the mold in which position it may be clamped by throwing the lever 16 into vertical position. If, now, the power device or power cylinder be set into operation, the ramming of the mold may be proceeded with, the rammer being guided by the workman who may control it either by grasping the cylinder 11 or the guiding tube 19, and the cross head 1 and cylinder 11 may gradually be elevated, since they may be counter-balanced, as indicated in Fig. 3, or otherwise. When the surface being rammed reaches such height in the mold that the cylinder has been lifted beyond convenient reach of the operator, the clamp is loosened to allow the cylinder to descend to its original or starting position, or to such extent as may be desired, and the clamp being reset the operation is proceeded with. One or two such shifts are usually all that will be required for a mold twelve feet in depth. So far as I am aware, a rammer shaft combined with a power device of any appropriate character and susceptible of the manipulation just described, is new. The arrangement enables the operator to control the speed and adjustment of the power device at all stages of the ramming of a mold, in a simple, economical and effective manner.

Fig. 3 shows much the same arrangement for ramming rotating flasks. Here there is indicated a standard 22 carrying at its top a horizontal track upon which runs a truck 23 over a pulley on which, as well as a pulley at the upper end of the standard, passes a counter-weighted suspension cable 24 by which are suspended the tube 19 for guiding the rammer shaft 18 and the tube 6′ at the end of which is mounted the power cylinder 11. In this case compressed air may be supplied by a flexible hose 25 attached at one end to a supply pipe in or along side of the standard 22 and at the other with a horizontal pipe 6^2 attached to the tube 6′. The position, horizontally, of the power cylinder may be varied by moving the truck which is controlled by a chain 26 different links of which may engage a hook or stud 27 on the side of the column.

Fig. 4 shows an arrangement for either stationary or revolving flasks. There is a swiveling support 2 suspended from an armored air supplying hose passing over a pulley on the truck. This swiveling support is shown as provided with one radially adjustable suspended armored hose or pipe carrying at its lower end the power cylinder 11 and having secured to it the guide tube 19 for the rammer shaft 18. Fig. 5 also shows an arrangement for either a stationary or rotary flask. The swiveling support carries two suspended ramming devices arranged diametrically opposite each other. The radius of the points of support of the ramming devices is adjustable as indicated to adapt the pair of rammer shafts to molds of different radius.

Fig. 6 shows an arrangement resembling Fig. 1 in respect to the cross-head 1 and pair of swiveling rammer supports 2. In this case, however, the cross-head 1 is formed with a centrally disposed flanged hub 28 that may be bolted to a support which in that case, preferably, would also be vertically adjustable (in the way disclosed in my prior patent, or otherwise) as well as capable of the other adjustments described. In these constructions the axes of the swiveling supports are fixed with reference to each other.

In Fig. 7, 29, 29, represent the carrying wheels of the truck and 30 their axle on

which are pulleys 31 over which pass the suspending and air supplying armored hose whose lower ends are connected to the centrally located hubs of the swiveling supports 2. The collars on which the pulley 31 turns may be adjusted along the shaft 30 by means of clamp bolts 31′, to adapt the apparatus to flasks of different diameter, or to the ramming of a double flask, or two separate flasks. The apparatus of each operator is capable of manipulation independently of that of the other one.

Fig. 8 shows a somewhat similar arrangement except that, in this instance, the carrying wheels 29, 29, run upon tracks suspended from, or located below, the track of the regular jib crane carriage the rails of which are marked 32, 32. The flasks and patterns may be handled by the jib crane.

Figs. 9 to 14 inclusive illustrate what I deem to be a more satisfactory organization for adjusting the radius of the points of suspension of the ramming devices. Thus, in Fig. 9, the arm 8′ having a bifurcated end 7 affording the point of suspension of flexible support 6 is pivoted on a horizontal pivot 35 preferably located below the swiveling support 2 in line of its axis. This pivot may be in an apertured flat lug 37 embraced by apertured jaws of the enlarged block 36 in which is fitted to slide horizontally the lever 8′ that may be adjustably secured in the block by clamp bolts 8^2. The headed pivot bolt 38 provided with a clamp nut may serve to lock the part in adjusted position if desired. By rocking the block 36 about axis 35, the radius of the point of suspension of the hose or rammer supporting device may be varied as indicated by the dotted lines.

Figs. 12, 13 and 14 show an organization wherein there is a plurality of rammer supporting devices. In this construction, the swiveling support 2 is formed at the bottom with a cross hub 39 to each end of which and at right angles thereto is a hollow horizontally disposed part 40 to each end of which is attached a rammer supporting cable or flexible hose 6. Each part 40 has a flat downwardly projecting lug 41 parallel with the part 40 and passing through both such lugs 41 is a clamp bolt 42 upon each end of which is pivoted a pair of rocking blocks 36′ in which are fitted to slide horizontally arms 36^2 adjustably held by set screws as shown and having bifurcated ends 7 that support the hose 6 or other flexible supporting means. There are, therefore, opposite pairs of rammer supporting means. This arrangement is desirable for ramming large molds as the rammer devices of each pair may be placed sufficiently close together to be controlled by one workman. The points of support of each pair of the rammer devices may be adjusted with respect to each other in the manner described. Each arm 8′ or 36^2 may be counter-weighted to assist the clamping bolt 38 or 42 in holding it in fixed position, and also for the purpose of facilitating its adjustment when the bolt is loosened. In Figs. 13 and 14 this counter-weighting is shown as effected by a suspended weight 43 attached to a cord secured in any one of a series of apertures in the lever arm 36′ to which it is applied. As stated the bolts 38 and 42 may be employed to clamp the blocks 36, 36′ so that when an adjustment is made it is permanently maintained. The general arrangement and behavior would, therefore, be analogous to that of other figures of the drawing. If, however, the arms 8′ and 36′ (preferably counter-weighted) are free to rock about their supporting axes, adjustment of the point of support 7 may be effected by the workman's manipulation of the cylinder, *i. e.* by moving it up or down. In that case counter-weighting of the arms 8′ or 36′ should be such as to reduce labor to a minimum; and counter-weighting of the main support of the apparatus should be such that change or movement of such main support to raise or lower the power device, and coöperating rammer shaft, will not occur until the arm 8′ or 36^2 has reached the limits of its rocking movements which are determined by stops 44, 45 against which abut the rocking blocks 36 and 36′. The primary purpose, however, of such arrangements as are disclosed in Figs. 9 to 14 is to afford play or flexibility of the suspended rammer devices such as to avoid jamming of the rammer shaft between the flask and pattern. This rocker arm mode of suspension may be used in each of the constructions disclosed in the drawings.

I claim:

1. Mold ramming apparatus comprising a power device, a vertically movable rammer shaft, and means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other.

2. Mold ramming apparatus comprising a power device, a vertically movable rammer shaft, means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other and a guide in which the shaft may be reciprocated vertically.

3. Mold ramming apparatus comprising a vertically adjustable power device, a vertically movable rammer shaft, and means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other.

4. Mold ramming apparatus comprising a vertically movable counterbalanced power

device, a vertically movable rammer shaft, and means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other.

5. Mold ramming apparatus comprising a vertically adjustable power device, a vertically movable rammer shaft, means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other and a guide in which the shaft may be reciprocated vertically.

6. Mold ramming apparatus comprising a vertically movable counterbalanced power device, a vertically movable rammer shaft, means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other and a guide in which the shaft may be reciprocated vertically.

7. Mold ramming apparatus comprising a vertically adjustable suspended power device, means for adjusting horizontally its point of suspension, a vertically movable rammer shaft and means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other.

8. Mold ramming apparatus comprising a vertically movable counter balanced support, a power device suspended therefrom, a rammer shaft and means for attaching the rammer shaft to and detaching it from the power device to permit of an adjustment of one of said parts relatively to the other.

9. Mold ramming apparatus comprising a counter balanced support swiveling about a vertical axis, a power device suspended therefrom, a vertically movable rammer shaft and means for attaching the rammer shaft to and detaching it from the power device to permit of adjustment of one of said parts relatively to the other.

10. Mold ramming apparatus comprising a counter balanced support swiveling about a vertical axis, a power device suspended therefrom, a vertically movable rammer shaft, means for attaching the rammer shaft to and detaching it from the power device to permit of adjustment of one of said parts relatively to the other and means for adjusting the radius of the point of suspension of the power device.

11. Mold ramming apparatus comprising a vertically suspended member, a power cylinder carried at the lower end thereof, a guide attached to the member and held parallel therewith, a rammer shaft adapted to reciprocate vertically within the guide, means for attaching the shaft to and detaching it from the piston of the power cylinder to permit of adjustment and means permitting the power cylinder to be raised and lowered.

12. Mold ramming apparatus comprising a power device suspended by a flexible member, a rammer shaft operated by the power device and an arm rocking about a horizontal axis whose free end engages the flexible member and constitutes the point of suspension thereof whereby on rocking said arm the radius of the point of suspension may be varied.

13. Mold ramming apparatus comprising a counter balanced support, a flexible member extending laterally therefrom, an arm rocking about a horizontal axis and over the end of which the flexible member passes, a power device and a rammer shaft actuated by it and suspended by said flexible member whereby on rocking the arm the point of suspension of the power device may be varied.

14. Mold ramming apparatus comprising a counter balanced support, a flexible member extending laterally therefrom, an arm rocking about a horizontal axis and over the end of which the flexible member passes, a power device, a rammer shaft actuated by it and suspended by said flexible member whereby on rocking the arm the point of suspension of the power device may be varied and stops limiting the vertical rocking movement of said arm.

15. Mold ramming apparatus comprising a horizontal arm mounted to rock freely vertically within limits, a flexible member extending over the end of said arm and a power device and rammer shaft suspended by said flexible member, whereby the point of suspension may be varied by causing the end of the arm to rock vertically.

16. Mold ramming apparatus comprising a pivoted rocking arm and a power device and rammer shaft suspended from and flexibly connected therewith.

17. Mold ramming apparatus comprising a support swiveling about a vertical axis, a rocking arm pivoted below the support and adapted to rock vertically and a power device and rammer shaft suspended from and flexibly connected with the rocking arm.

18. Mold ramming apparatus comprising a vertically rocking pivoted arm and a power device and rammer shaft suspended therefrom.

19. Mold ramming apparatus comprising a support swiveling about a vertical axis, a vertically rocking arm pivoted below the support and connected therewith and a power device and rammer shaft suspended from the rocking arm.

20. Mold ramming apparatus comprising a plurality of fluid pressure power devices and rammer shafts actuated thereby all suspended from a common point of suspension, and a single supply hose for supplying fluid under pressure to all of the power devices.

21. Mold ramming apparatus comprising

a pair of suspended swiveling supports, means for adjusting the distance between their centers and a power device and rammer shaft actuated thereby suspended from each of said supports.

22. Mold ramming apparatus comprising a pair of swiveling supports, means for adjusting the distance between their centers and a power device and rammer shaft actuated thereby suspended from each of said supports.

23. Mold ramming apparatus comprising a hollow cross-head, a cable for suspending it and a flexible hose connected with it, adjustable hollow end portions of the cross-head, flexible hose connected therewith, swiveling supports suspended by said hose, hose suspended from said supports, fluid pressure power device connected with the hose and rammer shafts therefor.

24. Mold ramming apparatus comprising a power device, a vertically movable rammer shaft arranged parallel with the axis thereof, and means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other.

25. Mold ramming apparatus comprising a power device, a vertically movable rammer shaft arranged parallel with the axis thereof, means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other and a guide in which the shaft may be reciprocated vertically.

26. Mold ramming apparatus comprising a vertically adjustable power device, a vertically movable rammer shaft arranged parallel with the axis thereof, and means for attaching the shaft to and detaching it from the power device to permit of vertical adjustment of one of said parts relatively to the other.

In testimony whereof, I have hereunto subscribed my name.

HENRY HENDERSON.

Witnesses:
WM. ST. G. KENT,
L. F. BROWNING.