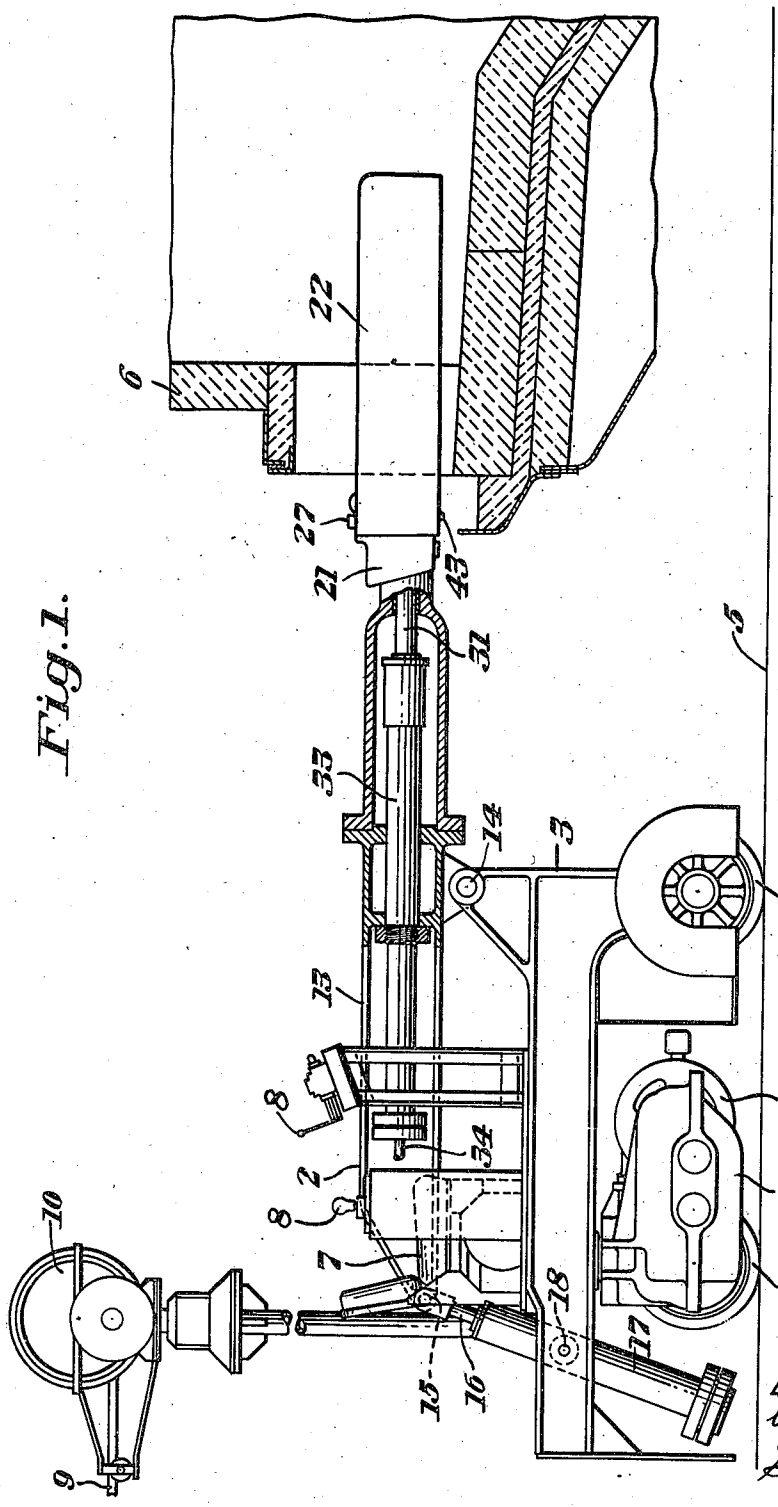
Aug. 6, 1946. E. E. BROSIUS 2,405,342

CHARGING MACHINE

Filed June 23, 1944 3 Sheets-Sheet 1

Fig. 1.



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CHARGING MACHINE

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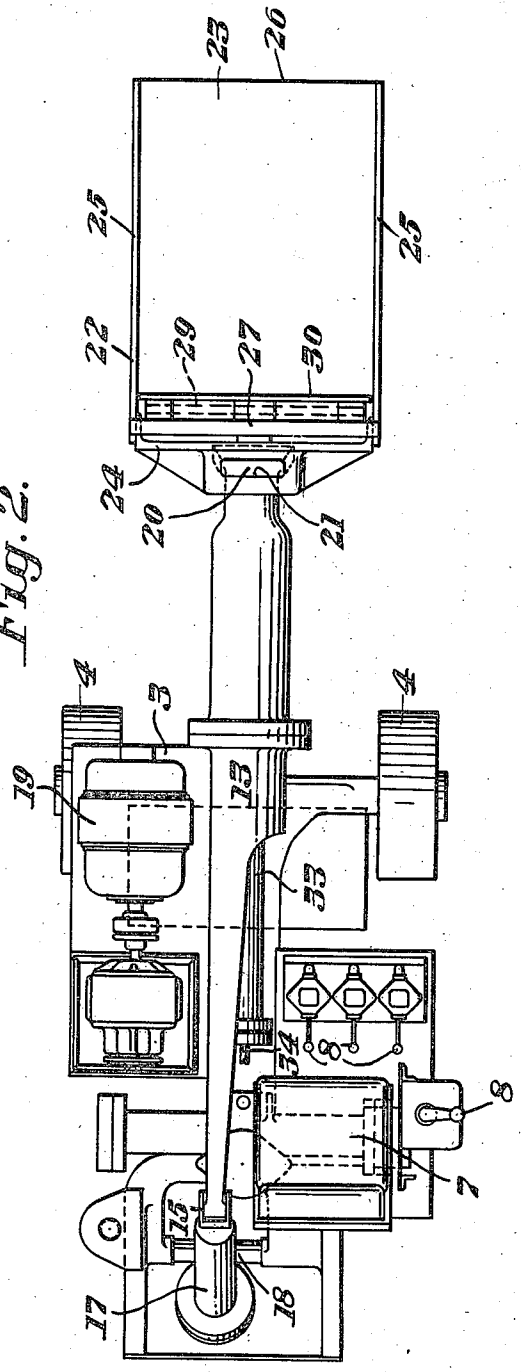


Fig. 2.

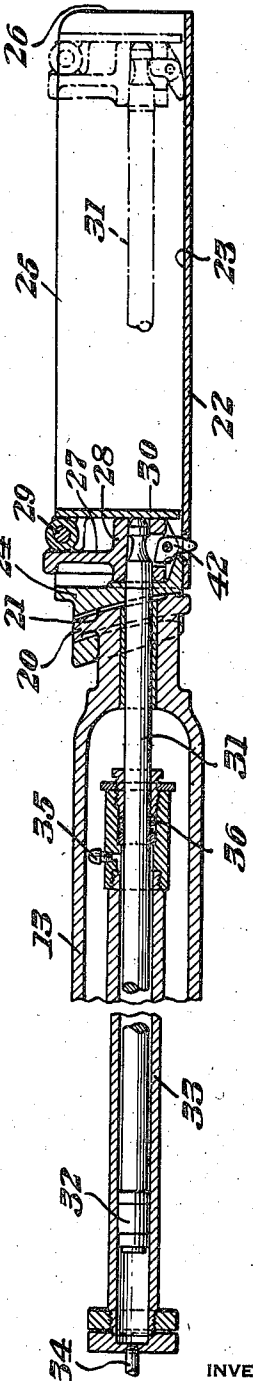


Fig. 3.

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CHARGING MACHINE

Filed June 23, 1944 3 Sheets-Sheet 3

Fig. 4

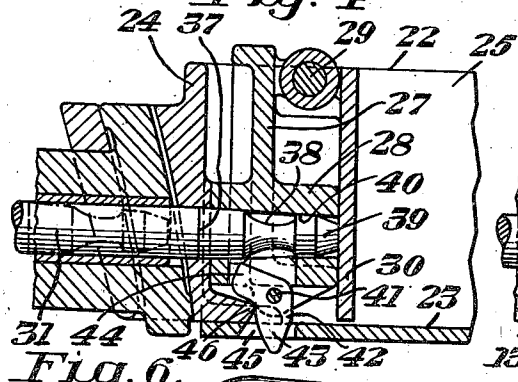


Fig. 5.

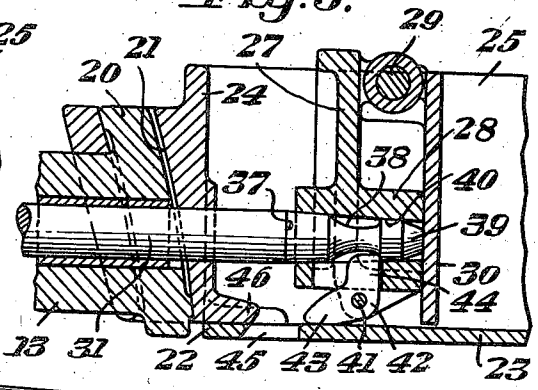


Fig. 6.

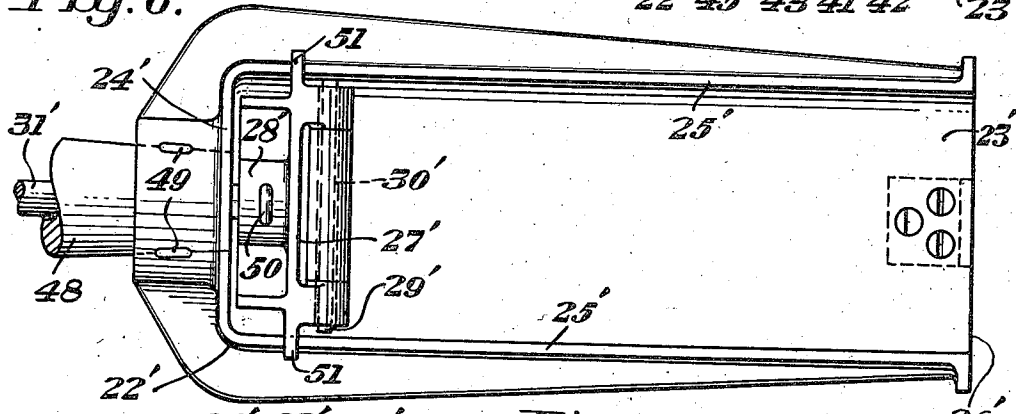


Fig. 7.

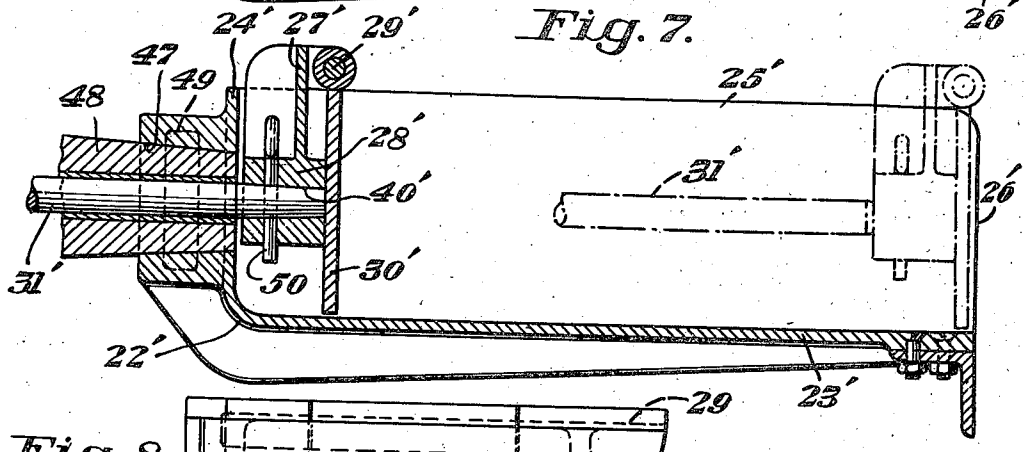
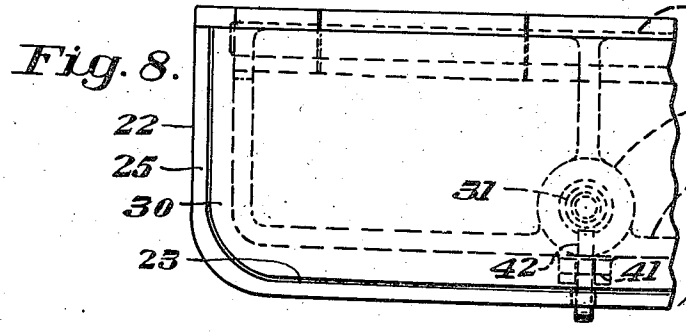


Fig. 8.



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UNITED STATES PATENT OFFICE

2,405,342

CHARGING MACHINE

Edgar E. Brosius, Pittsburgh, Pa.

Application June 23, 1944, Serial No. 541,842

3 Claims. (Cl. 214—29)

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This invention relates to charging machines, and more particularly to machines for charging furnaces and the like. The invention relates still more particularly to a charging machine for charging loose material, such, for example, as scrap, into a furnace or the like.

Charging machines for charging loose material into furnaces have heretofore, so far as I am aware, charged the material by introducing it into or over the furnace in a charging box and then inverting the box to dump out the material. This manner of charging is not fully satisfactory under certain conditions. For example, in charging an electric furnace it may be desired to deposit the charge accurately in a predetermined position relatively to the electrodes which is difficult or impossible when a charging box which must be inverted to dump its load is employed. Also in charging loose material into a furnace in which lies a pool or bath of molten metal it is desirable to introduce the material with the least possible disturbance of the bath. This likewise is difficult or impossible when a charging box which must be inverted to dump its load is used.

I have devised a charging machine for charging loose material into a furnace or the like which overcomes the disadvantages above pointed out. I provide for charging the material by expelling it from a charging box which is not inverted but which prior to expelling of the material therefrom may be accurately positioned or "spotted" within the furnace either in a desired position, as, for example, in a predetermined position relatively to the electrodes in an electric furnace, or very close to the surface of the bath when the furnace contains a molten pool. I preferably push the charge out of the charging box and to this end I may provide a charging box having an open end and a pusher movable within the box to push out the charge through the open end of the box.

I provide a charging machine comprising a carrier, a box carried by the carrier, a reciprocable member carried by the carrier and means connected with the reciprocable member and extending within the box for discharging from the box the contents thereof upon movement of the reciprocable member. Preferably the charging machine comprises a peel which carries the box, the peel also carrying the operating means which causes the contents of the box to be expelled or discharged.

I prefer to employ an open-ended box and a pusher extending within the box positioned generally parallel with the open end of the box to-

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gether with means for moving the pusher through the box toward the open end thereof to discharge the contents of the box. Desirably the means for moving the pusher is piston operated. The pusher preferably has a transverse dimension approximating the width of the box and may have a vertical dimension approximating the height of the box.

I prefer to provide the pusher with a hinged face and a support behind the face against which the face bears in discharging movements of the pusher, the face being swingable away from the support in return movements of the pusher to prevent binding of the pusher. Preferably the face of the pusher is hinged at the top so that upon return movements of the pusher it swings freely outwardly to pass over any particles of material which may lie in the box.

I further provide a charging machine comprising a support, a box detachably carried by the support, means extending within the box for expelling the contents of the box and means carried by the support and adapted to extend within the box for operating the expelling means, the operating means being withdrawable from within the box when the box is to be detached from the support. Means are preferably provided for connecting the expelling means or pusher and the operating means upon withdrawal of the operating means until the expelling means or pusher is fully withdrawn.

Other details, objects and advantages of the invention will become apparent as the following description of certain present preferred embodiments thereof proceeds.

In the accompanying drawings I have shown certain present preferred embodiments of the invention, in which

Figure 1 is an elevational view, partly in central vertical longitudinal cross section, of a charging machine, and showing the machine with its charging box entering a charging opening of a furnace;

Figure 2 is a plan view of the charging machine shown in Figure 1;

Figure 3 is an enlarged fragmentary central vertical longitudinal cross-sectional view through a portion of the charging machine;

Figures 4 and 5 are further enlarged fragmentary central vertical longitudinal cross-sectional views of a portion of the mechanism shown in Figure 3, illustrating the parts in various positions;

Figure 6 is a fragmentary plan view of a modified form of structure;

Figure 7 is a fragmentary central vertical longitudinal cross-sectional view of the structure shown in Figure 6; and

Figure 8 is a fragmentary end elevational view of the structure shown in Figures 1 to 5, inclusive.

Referring now more particularly to the drawings, there is shown a charging machine designated generally by reference numeral 2 which comprises a frame 3 mounted on wheels 4 and adapted to be freely maneuvered over the floor 5 in front of a furnace or row of furnaces one of which is designated generally by reference numeral 6. The charging machine shown is of the well known type known as the Brosius auto floor charger. An operator sits in a seat 7 and operates the charging machine from controls designated diagrammatically at 8. Power for operating the machine comes from a power source through an electric cable 9 wound upon a spring operated reel 10 as well known in the art. The charging machine as a whole is propelled by driving the rear wheel 4 from an electric motor 11 through a reduction gear drive 12.

Mounted on the frame 3 is a peel 13. The peel is pivoted to the frame at 14 and the rear end of the peel is pivoted at 15 to a piston rod 16 connected with a piston in a cylinder 17 pivoted to the frame at 18. The piston in the cylinder 17 is hydraulically operated by a hydraulic fluid such as oil compressed by a pump 19 carried by the frame. The hydraulic connections and valves are not shown as such means are well known in the art and do not constitute the present invention. By raising the piston in the cylinder 17 the front end of the peel may be tilted downwardly about the pivot 14.

The front end of the peel 13 has a projection 20 which extends generally upwardly and rearwardly as shown in Figure 3 and which is adapted to enter a socket 21 in a charging box 22 whereby the box is supported by the peel at the end thereof. The peel 13 is non-rotatable so that the box is always supported in upright position.

The charging box 22 has a bottom 23, a rear wall 24 and opposed side walls 25. It is open at the top and at its front end, which is designated 26. Hence the box is herein termed "open-ended," which term defines any box which either has a completely open and unobstructed end such as the end 26 of the box 22 and also any box through whose end the contents of the box may be discharged even though the box be provided with movable closure means such, for example, as outwardly swinging doors spring pressed inwardly against the end of the box but yieldable under pressure by the contents of the box to move outwardly and allow the contents to be discharged.

A pusher designated generally by reference numeral 27 extends within the charging box 22, the pusher comprising a body portion 28 to which is pivoted adjacent its top by a transverse horizontal pivot or pintle 29 a face member 30, the face member thus being in effect hinged to the body portion of the pusher and being turntable about the axis of the pintle 29. The face member 30 has a transverse dimension approximating the width of the box and also has a height approximating the depth of the box. When the face member is in its normal position it stands substantially vertical with its rear face bearing against the body portion 28 of the pusher as shown in Figure 3. It extends transversely of the

charging box 22 so that when the pusher is moved through the box from the full line position to the chain line position viewing Figure 3 the face member 30 engages the material in the box and pushes it out of the front end 26 of the box. When the pusher is pushing out the contents of the box through the open front end 26 it lies in normal position with its back against the body portion 28. Upon the return movement of the pusher the face member 30 is free to swing outwardly or in the counter-clockwise direction about the axis of the pintle 29, viewing Figure 3, to facilitate its passing over any particles of material which may remain in the box or may find their way into the box when the pusher is forward. This prevents binding of the pusher on its return movement.

The pusher is operated by a piston rod 31 connected with a piston 32 operating in a cylinder 33 mounted within the peel 13. The piston 32 is fluid operated, fluid connections to the cylinder 33 at its rear and forward ends being designated, respectively, at 34 and 35. The connections 34 and 35 may connect with oil lines leading to the pump 19, suitable control mechanism of known type being provided whereby oil under pressure may be admitted to either end of the cylinder 33 as desired. At the front end of the cylinder 33 the piston rod 31 passes out through a packing gland 36. The front end of the piston rod 31 is tapered to smaller diameter from the point 37 forward (see Figure 4) and the tapered portion has therein an annular recess 38 and a more steeply tapered nose 39.

The body member 28 of the pusher 27 has a tapered bore 40 for receiving the tapered extremity of the piston rod 31 as shown in Figure 4 so that when the piston rod is engaged within the tapered bore 40 the pusher 27 will be in effect rigidly positioned on the front end of the piston rod. When the piston rod is advanced toward the right viewing Figures 3 and 4 it will move the pusher with it.

Pivoted to the body portion 28 of the pusher at 41 is a double armed latch designated generally by reference numeral 42 having a generally downwardly projecting arm 43 and a generally upwardly projecting arm 44. The latch 42 is positioned so that when the arm 43 projects straight downwardly the arm 44 does not enter the recess 38 in the piston rod 31, if the piston rod is in the full line position of Figure 4. When, however, the latch 42 is turned in the clockwise direction viewing Figures 4 and 5 about the axis of the pivot 41 from the position shown in Figure 4 to the position shown in Figure 5 the arm 44 enters the annular recess 38 in the piston rod 31. In the bottom 23 of the box 22 is an opening 45 and at the rear of that opening is an upwardly and forwardly inclined detent 46. When the pusher is in its rearmost position as shown in Figure 4 the arm 43 of the latch 42 extends downwardly through the opening 45 in the bottom of the charging box and the arm 44 does not enter the recess 38 in the piston rod 31. When, however, the pusher moves toward the right viewing Figure 4, being impelled by the piston rod 31, the arm 43 of the latch 42 leaves the opening 45 in the bottom of the box and the arm 43 is turned from the position shown in Figure 4 to the position shown in Figure 5 and while in the latter position rides along the inner surface of the bottom of the box 22. When the latch is in the position shown

in Figure 5 the arm 44 thereof projects into the annular recess 38 in the piston rod.

The latch 42 has no function when the pusher is being advanced to discharge material from the box. The latch does, however, function on the return movement of the pusher as it insures that when the piston rod moves toward the left viewing Figure 5 it will carry the pusher with it, which it would not do but for the provision of the latch. The arm 44 of the latch enters the recess 38, as above stated, and on the rearward movement of the piston rod the shoulder defining the extremity of the recess nearest the end of the rod bears against the arm 44 so that as the rod moves to the left the latch must move with it and since the latch is connected with or forms part of the pusher the entire pusher must move with the rod.

When the pusher reaches the end of its return stroke the arm 43 of the latch 42 engages the detent 46 and the latch is turned in the counterclockwise direction about the axis of the pin 41 from the position of Figure 5 to the position of Figure 4, which causes the arm 44 to be withdrawn from the recess 38. This permits the piston rod 31 to move rearwardly to at least the position indicated in chain lines in Figure 4 when it lies entirely within the peel, permitting the box 22 to be removed from the end of the peel. This is customarily done by lowering the end of the peel to set the box down on a suitable support and then continuing the lowering of the peel until the projection 20 moves downwardly out of the socket 21. When the box is to be picked up again the end of the peel is positioned under the socket 21 and is then raised so that the projection 20 enters the socket, this of course being done with the piston rod in its fully retracted position as indicated in chain lines in Figure 4.

In operation the charging box 22 is filled with loose material, such, for example, as metal scrap, to be charged into a furnace or the like and the charging machine is moved so as to introduce the charging box into or over the furnace with the front end 26 of the box directly above the point at which it is desired to deposit the charge. If the furnace contains a bath of molten metal and it is desired to introduce the charge with the least possible disturbance of the bath the front end of the peel will be lowered until the open front end 26 of the charging box 22 is approximately at the level of the bath. Fluid is then admitted into the cylinder 33 behind or to the left of the piston 32, viewing Figure 3, to move the piston rod 31 to the right from the position indicated in chain lines in Figure 4. The piston rod moves relatively to the pusher 27 until the tapered front end of the rod enters the tapered bore 40 in the body portion 28 of the pusher. After the tapered front end of the piston rod has seated itself in the tapered bore 40 the pusher is pushed forward by the piston rod, the latch 42 moving from the position of Figure 4 to the position of Figure 5 as above explained. The pusher pushes the material out of the charging box through the open front end 26 thereof. The face member 30 of the pusher directly engages the material in the box to expel it from the box. Upon the return movement of the pusher from right to left viewing Figure 3 the face member 30 is free to swing outwardly about the axis of the pintle 29 to clear any loose material which may remain in the box or which may have found its way into the box

when the pusher was in its forward position. When the pusher reaches its rearmost position the latch 42 moves from the position of Figure 5 to the position of Figure 4, thus freeing the piston rod so that it may be retracted relatively to the pusher to permit the box to be disengaged from the peel if desired. When the pusher reaches its rearmost position the face member 30 assumes its operative position ready for the succeeding charging operation.

The controls for directing fluid into and out of the cylinder 33 through the connections 34 and 35 are mounted in front of the operator's seat 7 so that movement of the charging machine about the floor and complete operation of the machine are effected by the one operator seated on the machine.

In Figures 6 and 7 there is shown a modified form of structure in which parts corresponding to parts shown in Figures 1 to 5, inclusive, are designated by the same reference numerals each with a prime affixed. In this form of structure the charging box 22' is fixed to the peel 33'. The charging box has a socket 47 in its end which receives the tapered end 48 of the peel, the box being held in place on the peel by keys 49. Likewise the piston rod 31' is fixed to the pusher 27' by a pin 50 passing through aligned holes in the pusher and piston rod. This does away with the necessity of providing the latch 42 of the form of structure shown in Figures 3, 4 and 5; likewise there is no occasion for providing the recess 38 in the piston rod. The operation of the mechanism shown in Figures 6, 7 and 8 is exactly the same as that of the mechanism shown in Figures 1 to 5, inclusive, except that the box 22' is not readily detachable from the peel as is the box 22. When it is desired to change boxes in the form of structure of Figures 6 and 7 the pin 50 and the keys 49 are removed, the piston rod 31' is withdrawn and the box is moved endwise off of the end of the peel.

In both forms of structure shown, but as indicated most clearly in Figure 6, the pusher has opposed projections 51 which extend over the tops of the side walls of the charging box and rest thereupon during the operation of the pusher, this insuring supporting of the pusher in proper relation to the box.

While I have shown and described certain present preferred embodiments of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. A charging machine comprising a support, a box detachably carried by the support, a pusher extending within the box for pushing out the contents of the box, means carried by the support and adapted to extend within the box and to bear against the pusher to operate the pusher in box emptying movements, the operating means being withdrawable from within the box when the box is to be detached from the support, a latch pivoted to the pusher, the latch having a portion adapted to interengage with the operating means in one rotative position of the latch when the pusher is in advanced position for connecting the pusher and operating means to cause them to move together as a unit, and means for turning the latch about its pivot to render it inoperative when the pusher is in its fully withdrawn position to allow the operating means to

be withdrawn from within the box to permit the box to be detached from the support.

2. A charging machine comprising a support, a box detachably carried by the support, a pusher extending within the box for pushing out the contents of the box, means carried by the support and adapted to extend within the box and to bear against the pusher to operate the pusher in box emptying movements, the operating means having a recess therein and being withdrawable from within the box when the box is to be detached from the support, a double-armed latch pivoted to the pusher and one arm of which engages a portion of the box when the pusher is advanced to position the other arm in the recess of the operating means whereby to connect the pusher and operating means to cause them to move together as a unit and means engaging the first mentioned arm of the latch when the pusher is fully withdrawn to turn the latch about its pivot and withdraw the second mentioned arm of the latch from the recess in the operating means to allow the operating means to be withdrawn from within the box to permit the box to be detached from the support.

3. A charging machine comprising a tiltable support having means for engaging from beneath and holding a material carrier upon upward tilting movement of the support, a material carrier having means for receiving said first mentioned means whereby the carrier is held by the support, the carrier also having a pusher movable therealong to eject material from the carrier, the pusher having an impeller receiving portion, the support having an impeller movable longitudinally thereof, the cooperating portions of the support and carrier being so constructed and arranged that upon upward tilting movement of the support relatively to the carrier to the extent necessary to fully interengage said first mentioned means and said second mentioned means the impeller is brought into position opposite the impeller receiving portion, means for advancing the impeller to first engage the impeller receiving portion of the pusher and then advance the pusher to eject material from the carrier and for retracting the impeller to first retract the pusher and then disengage the impeller receiving portion of the pusher, a latch pivoted to the pusher operative when the pusher is in advanced position for connecting the impeller and pusher to cause them to move together as a unit and means for turning the latch about its pivot to render it inoperative when the pusher is in its fully retracted position to allow the impeller to be disengaged from the impeller receiving portion of the pusher and withdrawn so as to render the carrier disengageable from the support upon downward tilting movement of the support.

EDGAR E. BROSIUS.