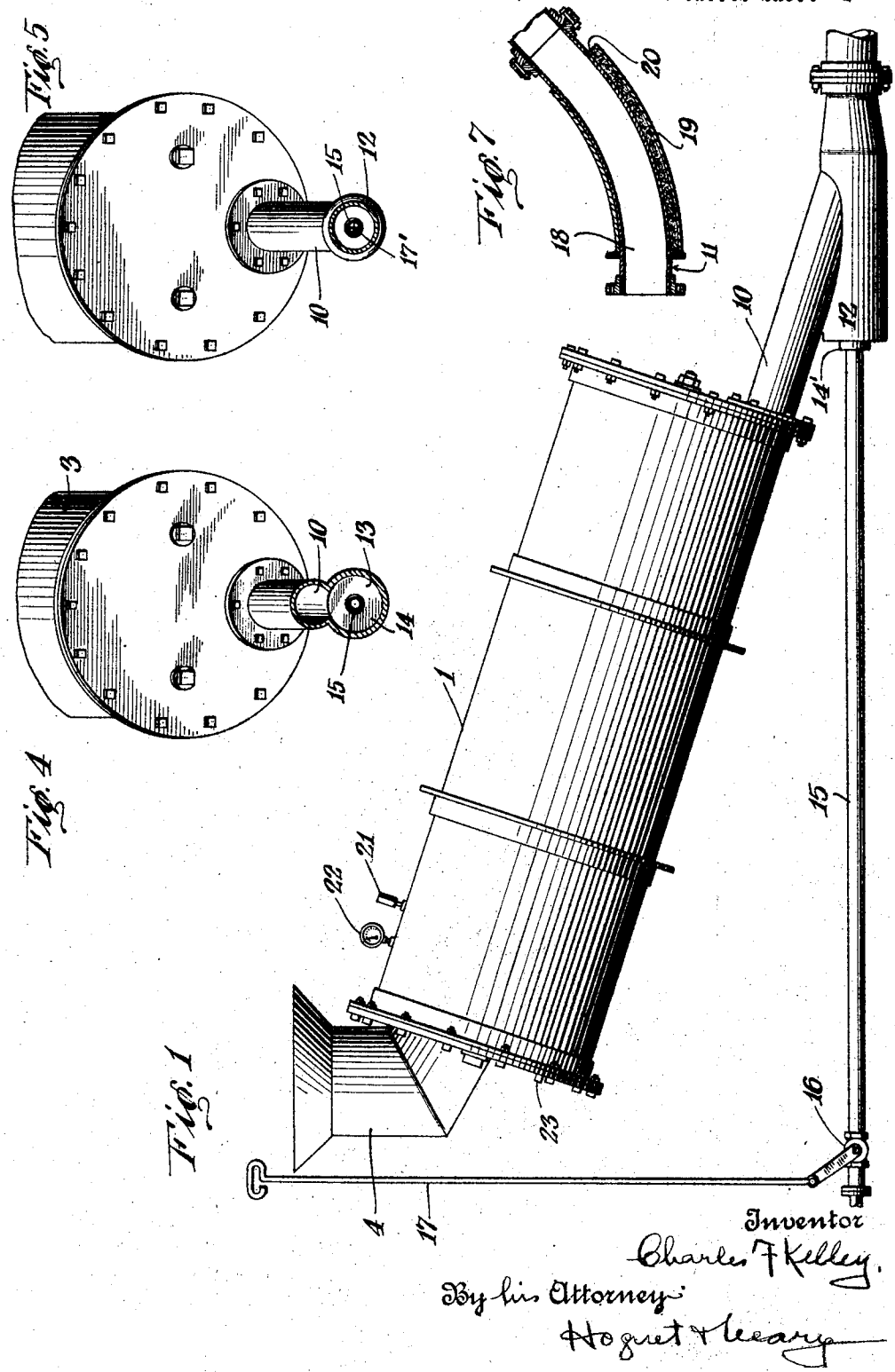
Nov. 29, 1932. C. F. KELLEY 1,889,480

CONTINUOUS FEED GUN FOR CONCRETE OR PLASTIC MATERIALS

Filed Jan. 21, 1931 2 Sheets-Sheet 1



Inventor
Charles F. Kelley.
By his Attorneys
Hoguet & Kearney

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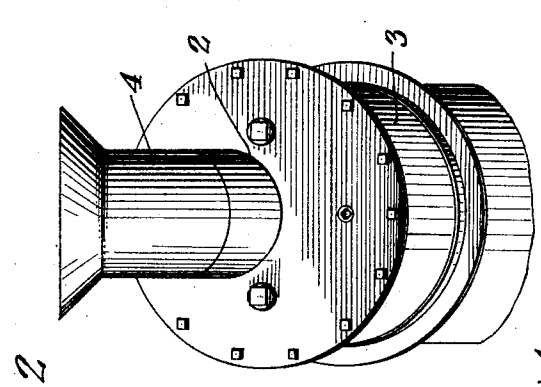

Fig. 2

Fig. 3

Fig. 8

Fig. 6

Inventor
Charles F. Kelley.

By his Attorneys
Hoguet & Cleary

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CHARLES F. KELLEY, OF JACKSON HEIGHTS, NEW YORK

CONTINUOUS FEED GUN FOR CONCRETE OR PLASTIC MATERIALS

Application filed January 21, 1931. Serial No. 510,242.

This invention relates to a continuous feed gun for concrete or plastic materials.

It has been the practice for some time past to emplace concrete or other such material by means of a gun which consists essentially of a chamber for the material and a conveyor for conveying the material from the chamber to the point where it is to be emplaced. This method of emplacing the material has been practiced especially where it has been impracticable to emplace the material by the ordinary dumping method.

The guns which have been used in the past consisted primarily, as heretofore stated, of a chamber for the material which is to be emplaced and a pipe leading from the chamber to the point of emplacement, through which pipe the material is carried and from which it is ejected by air pressure. The pipe used varies in length according to the distance between the supply chamber and the point of emplacement of the material, some times reaching a length of several hundred feed. It is necessary in building up this length of pipe to use elbows.

The guns which are at present in use have many faults. For instance, they are built to receive and eject one charge of material at a time. This necessitates the placing of the material in the supply chamber through the charging door, the closing of the door, the application of the air pressure to eject the material from the chamber and the pipe, the release of the air pressure after the ejectment has taken place, opening of the charging door, and the recharging of the chamber. In actual practice one third of the time consumed for the complete cycle is used in charging and closing the door of the chamber. The second third is consumed in actually conveying material to the point of emplacement and the last third is used in blowing the chamber and the line clear of the material and the reopening of the chamber door for the receipt of a second charge.

The present invention contemplates the continuous feeding of the material and the continuous ejectment of the material from the pipe to the point of emplacement. The result is that two thirds of the time consumed by the old method is saved with the result that a great deal more material may be emplaced in a given time by employing the present invention than by employing any of the methods which are now generally in use.

Furthermore, in the gun of this invention the air pressure is continuous and is continuously used whereas in the machines of the prior art it is necessary to reduce the pressure to zero during the charging operation and then re-establish it to the proper degree. This obviously results in a loss between each blowing operation.

Moreover, the travel of the material through the elbows to which I have above referred wears the elbows to such an extent that very little of the material may be emplaced before the elbows completely wear through and must be replaced by new elbows. This replacement is usually very difficult and consumes a great deal of time.

It must be remembered in this connection that the full length of pipe line is some times hundreds of feet, so that when it is necessary to replace an elbow the elbow must be exactly the length of the elbow which is replaced. If it is longer or shorter it will not fit so that sometimes it is necessary to try a great number of elbows before one which will fit the particular space is located. This too consumes time which might otherwise be used in emplacing the material. The present invention relieves this difficulty.

Moreover, it has been found in practicing the methods which are now generally in use that a deposit of the material accumulates at the bottom of the pipe and in the case of concrete hardens so that the effective area of the pipe is greatly reduced. This reduction

gradually increases until the pipe must be replaced by another.

The present invention relieves this difficulty in that no material accumulates on the bottom of the pipe.

There are many other advantages flowing from this invention which will not be here enumerated but which will appear as the description of the invention progresses.

In the drawings I have illustrated one embodiment of the invention, but it is of course to be understood that I do not limit my invention to this embodiment but only to the extent that it is limited by the claims.

Figure 1 is a side elevation of the gun.

Figure 2 is an end view of the gun.

Figure 3 is a vertical longitudinal sectional view thereof.

Figure 4 is a sectional view on line 4—4 of Figure 3.

Figure 5 is a sectional view on line 5—5 of Figure 3.

Figure 6 is an enlarged perspective view of the air nozzle.

Figure 7 is a section of one of the elbows; and

Figure 8 is a detailed sectional view.

The embodiment of the invention which I have illustrated in the drawings includes a chamber 1, which preferably, but not necessarily, is cylindrical and is inclined downwardly from the receiving end to the discharge end, the angle of inclination being dependent upon the character of the material being handled. This chamber is supported in this position by any suitable means (not shown). The chamber at the receiving end is provided with a receiving opening 2 which is well above the lower wall 3 of the chamber 1. A receiving chute 4 having a removable grating 5 to exclude material which is undesirably large in size extends into the opening 2 and is secured therein. The end of this chute is inclined from the vertical and to it is hinged a door 6, which is sufficiently above the bottom of the chamber so that it will be free of the material in the chamber when it swings to its closed position. The inclination of the end of the chute is such that when the door assumes its position under the action of gravity the end of the chute will be open to permit the passage of the material from the chute into the chamber 1. It is to be noticed that the downward vertical extension of the wall of the chute 4 adjacent the chamber 1 passes through the opening of the chute within the chamber. This establishes a direct outlet path from the upper part of the chute through the opening of the chute within the chamber 1. The purpose of this is so that the portion of the material which falls directly through the chute 4 into the chamber 1 will form a wall and prevent the remainder of the material which follows the angular contour of the chute from splashing on the door 6 when it is in its open position. By this means all of the material is allowed to drop from the chute opening into the chamber 1 without touching the door. Therefore, no material will accumulate on the door 6 and consequently there will be nothing which will prevent the perfect closing of the door when it is necessary. The door 6 is hinged at the upper part of the chute as at 7, and in order that the joint between the door and the chute may be made air tight the chute is provided with a double beveled edge as at 8, which cooperates with the yieldable surface 9 on the door to maintain a tight joint when the door is closed. This beveled edge insures that any lump or stone will be forced either up or down when the door 6 assumes its closed position, so that an air tight joint may be produced.

A pipe 10 extends from the bottom of the discharge end of the chamber 1 and is connected to the conveyor or discharge pipe 11. This pipe 10 is preferably one branch of a Y-pipe 12, the other branch 13 of which is provided with a closure having a central opening therein. This closure consists preferably of a collar 14 welded in place and a plate having an apertured extension 14′, the extension being threaded at the aperture to receive the pipe 15 and the nozzle 15′. The extension 14′ extends into the opening 14″ of the collar 14 which opening is of greater diameter at the outer end than at the inner end to insure the easy withdrawal of the plate in spite of the presence of hardened concrete. The air pipe 15 is so positioned that the nozzle 15′ will discharge air under pressure into the pipe 11. This air pipe 15 is provided with a quick opening valve 16 and is connected with a suitable source of air under pressure. The valve 16, preferably has an operating handle 17 which extends to a point adjacent the inlet chute 4, so that the same operator who directs the material into the chute 4 controls the valve.

The nozzle is provided with two vanes 17′ arranged as shown in Figure 6.

As I have stated above, in actually using a gun of this type the pipe 11 contains elbows. One of these I have illustrated at 18. The presence of the elbow or elbows in the line of pipe serves not only the function of directing the pipe to the point of emplacement, but also results in the retardation of the material so that the pressure air will be effective to carry the material from the pipe.

In the past as the material passed around the elbow it impinged against the outer curve and wore it through within a relatively short time. In order to overcome this disadvantage I place a sleeve 19 of greater diameter around the elbow, the sleeve being secured in position as for instance by welding, as shown in Figure 7. Between this sleeve and the elbow 18 is packed granular carborundum

mixed with only sufficient binder to hold it together. This binder may be neat cement grout. As is well known carborundum is of a high order of hardness. Its presence in the space 20 between the sleeve 19 and the elbow 18 will result in the formation of an elbow which will resist the wear incident to the passage of the material through the elbow and consequently will obviate the necessity for replacing the elbow during the use of the gun.

In using the gun, the material which is to be emplaced is poured into the chamber 1 through the chute 4, the door 6 being open and in the dotted line position at this time. The valve 16 is then opened whereupon the air will be ejected from the nozzle at the end of the pipe 15. The pouring of the material into the chamber 1 may thereafter be continuous. As the air leaves the nozzle it will be given by the vanes 17′ a whirling motion and the material will be carried along the pipe 11 to the point of emplacement by the air.

At the present time the material in the guns which are now on the market is forced through the pipe corresponding to the pipe 11 by air which is ejected from an ordinary pipe. The result is that after the gun has been in use for a time there is an accumulation of the material on the bottom of the conveyor pipe. This is because the material has a tendency to fall to the bottom of the pipe and the air a tendency to pass over the material. Using, however, the nozzle which is part of my invention the air is given a whirling motion through the pipe 11. This forms in effect a hollow cylindrical conveyor of air, so that there is a layer of whirling air under pressure between the wall of the pipe and the material which is being forced therethrough. In addition, there is air under pressure commingling with the material to carry it through the pipe. The result of this is that all of the material is carried through the pipe in a whirling condition and none is left as a deposit at the bottom of the pipe.

The ejection of the air from the nozzle 15′ at the end of the pipe 15 forms a suction in the chamber 1 which causes the material to flow downwardly along the incline to the bottom of the chamber into the pipe 10 to a point in advance of the nozzle. Because of the fact that the flow of the material from the chamber 1 is influenced by the ejection of the air from the nozzle the feeding of the material from the chamber 1 bears a direct relationship to the air which is ejected from the nozzle. In other words, there is never a feeding of a greater amount of material from the chamber 1 to the nozzle than the nozzle can properly force through the pipe 11. Should there be a stoppage in the pipe 11 brought about, for instance, by the character of the material which is being fed therethrough, the air pressure will back up in the chamber 1 and close the door 6 momentarily, and until the pressure within the chamber is raised to such a point that it will be sufficient to break down the stoppage in the pipe 11. When this takes place the pressure is relieved in the chamber 1 and the door 6 automatically opens.

The inclined position of the chamber 1 allows the material to slide down from the receiving to the discharging end so that no voids are created within the mass of material by the suction action of the nozzle. Of course, it is desirable to equip the chamber 1 with a release cock 21, so that the pressure in the line may be released when there is a permanent stoppage in the pipe to permit repair, and with a gauge 22, and also to provide the chamber with an opening 23 which is usually closed by a plug, so that when it is desired to loosen any substance in the chamber or around the nozzle a rod may be inserted to accomplish this.

It is of course to be realized that with this invention the chamber 1 need not have any great capacity since the material may be fed continuously into it. This is a distinct advantage over the machines now on the market because of the intermittent charging of the chamber. In view of the fact that this latter machine discharges only one charge of the chamber at a time the chamber must necessarily be of a relatively large capacity.

What I claim is:

1. In a device of the class described, the combination with an outlet pipe of a material supply conduit communicating therewith, a pipe communicating with the outlet pipe and adapted to discharge air under pressure into the same to force the material through the outlet pipe, and means operative under the action of the air to close the material supply conduit upon the occurence of a stoppage in the outlet pipe.

2. In a device of the class described, the combination with an inclined chamber, having a receiving opening and an outlet opening, of a door for closing the receiving opening and so positioned that it will swing to an open position automatically under the action of gravity, a Y-pipe, one branch of which communicates with the outlet opening of the chamber and a pressure pipe adapted to extend into the other branch and adapted to eject air under pressure in a direction away from the chamber.

3. In a device of the class described, the combination with an outlet conduit of an inlet conduit communicating therewith, means for injecting air under pressure into said outlet conduit in a direction away from the inlet conduit, and a door in the inlet conduit adapted to close under super-atmospheric pressure built up in the inlet conduit by a stoppage in the outlet conduit.

4. In a device of the class described, the

combination with a chamber having a receiving opening and an outlet opening, a conduit extending from the outlet opening, a normally open door for the receiving opening adapted to close said opening automatically upon the creation of a super-atmospheric pressure within the chamber, and a fluid pressure pipe extending into the conduit beyond the outlet opening and in a direction away from the latter.

5. In a device of the class described, the combination with a chamber having an inlet opening and an outlet opening of a conduit extending from the outlet opening and open only at its communication with said chamber and at its end remote therefrom, a normally open freely-swinging door adapted to close the inlet opening, and means for injecting fluid under pressure into the conduit in a direction away from the chamber.

6. In a device of the class described, the combination with a chamber having an inlet opening and an outlet opening, a conduit extending from the outlet opening, means for injecting fluid under pressure into said conduit in a direction away from the chamber, the plane of the inlet opening being at an angle to the vertical and a door normally occupying a vertical position and adapted to close the inlet opening when the pressure in the chamber exceeds atmospheric pressure.

7. In a device of the class described, the combination with a chamber having an inlet opening and an outlet opening, of a conduit extending from the outlet opening and a door normally occupying a position at an angle to the plane of the inlet opening and adapted to be operated to close said opening when the pressure within the chamber exceeds atmospheric pressure by said increased pressure.

8. In a device of the class described, the combination with a cylindrical chamber arranged in an inclined position and having an inlet opening at its upper end and an outlet opening at its lower end, of a conduit extending from the outlet opening, a fluid pressure supply pipe extending into said conduit and adapted to discharge in a direction away from the chamber, and a door pivoted adjacent the upper end of the inlet opening adapted to automatically open under the action of gravity and to automatically close when the pressure within the chamber exceeds atmospheric pressure.

9. In a device of the class described, a material conveying system normally open at its inlet and outlet ends, means for injecting fluid pressure into said system, and means operated by the fluid pressure for momentarily closing the inlet end of the system when the outlet end becomes closed by the material being operated upon.

10. In a device of the class described, the combination with a conduit adapted to convey the concrete and having a normally open receiving end and having an open outlet end, of means for discharging fluid under pressure into said conduit in a direction towards the outlet end, and means for closing the inlet end of the conduit when the pressure within the conduit, adjacent the inlet end thereof, exceeds atmospheric pressure, said means being operated by said pressure.

In testimony whereof, I have signed my name to this specification this 20th day of January, 1931.

CHARLES F. KELLEY.