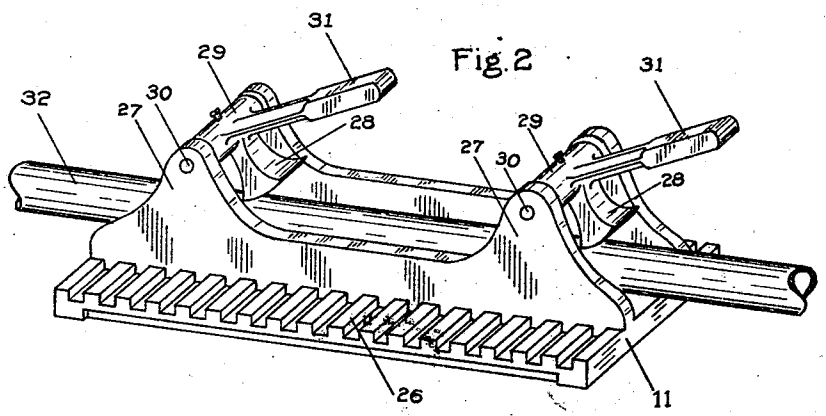
Jan. 8, 1929. 1,698,498

C. R. HARDING

PIPE PUSHER

Filed Nov. 18, 1926

Fig. 2



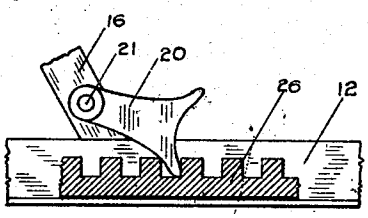
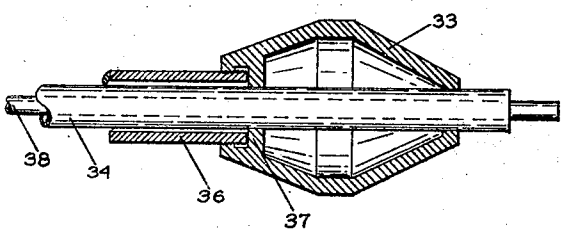


Fig. 3

Fig. 1

Fig. 4



C. R. Harding *INVENTOR.*

BY Emil F. Lange

ATTORNEY.

Patented Jan. 8, 1929. 1,698,498

UNITED STATES PATENT OFFICE.

CLYDE R. HARDING, OF COUNCIL BLUFFS, IOWA.

PIPE PUSHER.

Application filed November 18, 1926. Serial No. 149,138.

My invention relates to devices for laying pipe underground without the necessity of excavating or trench digging and it has two main objects in view.

Circumstances frequently demand that pipe be withdrawn from the ground and one of the objects of my invention, therefore, is the provision of a pipe pusher which can be made to function as a pipe puller without the necessity of resetting the machine. The laying of tile and the like is impossible with pipe pushers of the usual types and a second object of my invention is the provision of an attachment whereby a hole of sufficient size may be made in the soil for inserting tile. Other objects will be mentioned in the following description.

Referring now to the drawings,

Figure 1 is a view in perspective of the entire pipe pusher and the head.

Figure 2 is a view in perspective of the carriage on a somewhat larger scale than that of Figure 1.

Figure 3 is a fragmentary view in plan and including portions of the base and carriage and showing particularly the relation of the pawls to the rack.

Figure 4 is a view in lengthwise section of the head and push pipe, and showing also the pipe for conducting water under pressure to the head.

The reversible pipe pusher includes the base 10 and the carriage 11. The base 10 has side members 12 of angle steel, the side members being secured in spaced apart and parallel relation by means of the straps 13 at the ends of the side members and by a strap 14 midway between the straps 13. The number of these straps may, of course, be varied at will but it is essential that the structure be firm and rigid enough for the work which it is intended to do. The straps 13 and 14 project on both sides of the base so that they may be firmly anchored to the earth to prevent their movement during the operation of the pipe pusher.

Secured to the side members 12 and on the outer sides thereof are additional straps 15 which are bent so as to space portions of them away from the side members 12 as shown in Figure 1. The pawl carrying U-shaped levers 16 and 17 enter the spaces between the side members 12 and the straps 15 and are secured thereto by means of the pivot pins 18. In order to reinforce these levers reinforcing straps 19 are secured to the levers 17 and to the pivot pins 18, the straps 19 being positioned outside of the straps 15. The levers 16 and 17 have pawls 20 pivotally secured thereto at 21 so as to swing freely. The pawls 20 are symmetrical as shown in Figure 3, for reasons which will be subsequently explained. The pawls are positioned in close proximity to the inner walls of the vertical portions of the side members 12. The levers 16 and 17 are actuated by means of the lever 22 which is pivoted at 23 to the side members 12 and to the straps 15, and which acts on the levers 16 and 17 through the links 24. The lever 22 is also U-shaped and it terminates at its upper end in the handle member 25 which may be either grasped by the hands or which may receive the end of the gas pipe extension.

The carriage shown in Figure 2 is designed for sliding movements in the base between the side members 12. It consists of a pair of rack portions 26 which cooperate with the pawls 20 and of a device for rigidly securing the pipe which is to be pushed. The racks 26 are cut in the base at its lateral edges, and between the racks the base is provided with two pairs of upwardly projecting ears 27. The dogs 28 have collar portions 29 fitting between the ears of a pair and they are secured to the ears by means of removable pivot pins 30. Both of the dogs are weighted by means of weights 31 which are integral with the dogs 28 and the collars 29. The pipe 32 is firmly gripped by means of these dogs and any pushing action on the carriage in a forward direction increases this grip.

In use, the base is firmly anchored to the ground and the carriage 11 is loosely positioned in the base. The pipe 32 is then clamped in the carriage 11 in the manner shown in Figures 1 and 2. The actuation of the lever 22 will cause the pawls 20 to be moved forwardly and backwardly, and each forward motion of the pawls acting on the racks 26 causes the forward movement of the carriage and with it the pipe 32. The rearward movement of the pawls simply brings them into engagement with another notch of the rack where they will be in position for another forward step when the lever 22 again moves forwardly. The reciprocation of the lever 22 may be continued until the end of the rack 26 is reached at which time the dogs 28 must be released to permit the

carriage to be moved rearwardly until the pawls 20 are again in engagement with the forward notches of the racks 26. The release of the dogs 28 is an easy matter since the weights 31 may serve as levers for lifting the dogs out of engagement.

Such pipes as that shown at 32 are usually pushed through the soil in a more or less horizontal direction and this can easily be done by successive steps in the manner above described. When it is desired to install a lead pipe, the steel or iron pipe should first be forced through the ground in the manner already described and it should then be withdrawn with the end of the lead pipe secured to it. In this manner the lead pipe is drawn through a hole which is already made so that the lead pipe is not subjected to a rough usage for which it is not adapted. The pipe 32 may be withdrawn from the hole by resetting the base 10, but the use of the reversible pipe pusher herein described makes such resetting unnecessary. If the pawls 20 are swung about their pivots they will, of course, act in the opposite direction and will exert a pull in the opposite direction on the carriage 11. In order to hold the pipe in the carriage on the reverse pull the carriage may be turned end to end in the base 10 or the pivot pins 30 may be withdrawn in order to reverse the dogs 28. The reciprocation of the lever 22 will then result in the withdrawal of the pipe 32 from the hole which it has formed.

It is frequently necessary that a hole be formed which is larger than is practicable by the use of pipe as above described. For such situations I have provided a special form of head as shown at 33 in Figures 1 and 4. This head is in the form of a double cone which is cast directly on a section of pipe 34. The pipe 34 has a reduced end 35 which serves as a nose for the head 33. The rear end of the head is open and is interiorly screw-threaded for the reception of the end of the push pipe 36, the push pipe being the one which is secured in the pipe pusher by the dogs 28. The head 33 is provided with a wall 37 which serves as an abutment for the end of the pipe 36.

The most common use to which pipe pushers are put is the laying of pipe without digging trenches. Trench digging is always expensive and in most cases it is impossible. In busy streets it would necessitate the temporary abandonment of the street while the trench is being dug and filled up. The pipe pusher, however, will lay the pipe perfectly without disturbing the pavement or the street. Pipe pushers are particularly useful around railroads. Railroads are often inadequately drained so that pools of stagnant water are formed at their sides. These pools, especially in and around towns, become a menace to health. Trenching is impossible and tunneling is usually prohibited by the rules of the railroad companies. The pipe pusher will easily lay the pipe without disturbing the road bed. Around railroad shops it is, often necessary to lay a water line, steam line or waste line under tracks and this can easily be done by the use of the pipe pusher.

Aside from the more common use the pipe pusher as above described has a number of other very important uses. In the connections with water mains, lead pipe is used almost exclusively and lead pipe cannot be pushed. With the usual form of pipe pusher it is possible to force the iron or steel pipe through the ground, to then reverse and reset the machine and to finally draw the iron pipe from the hole with the end of lead pipe secured thereto. With the machine as above described the resetting of the machine is not necessary as its action may be reversed in a few minutes' time. This reversing action is particularly important when it is desired to remove corroded pipe and to replace it with new pipe. In such a case the corroded pipe is first withdrawn by the pipe pusher, its action is then reversed and the new pipe is pushed through the opening left by the old pipe.

Machines of this kind, of course, have their limitations as regards the size of the pipe which is to be pushed. Beyond a certain diameter it is impracticable to push pipe as the initial cost and the weight of the machine would be prohibitive. Tile and cast iron pipe are usually laid in trenches but with the use of the special head as above described it is possible to lay tile and cast iron pipe having diameters of up to 15 inches. For this use a head of the proper diameter is forced through the earth in the manner described and the tile is then drawn through the hole formed by the head, the drawing being done either by hand or by the pipe pusher on the reverse action. The resistance of the soil to the pusher head varies with the square of the diameter of the head. In the pipe pusher as above described the enormous resistances of the soil are overcome in two ways. The machine itself is rugged enough to withstand these resistances so that it is only necessary to increase the leverage. This can easily be done by using a length of gas pipe. Then too, the resistances may be materially reduced by means of the water jet which has a twofold function. It lubricates the walls of the hole and it removes much of the clay which is in the path of the head.

Having thus described my invention in such full, clear, and exact terms that its construction and operation will be readily understood by others skilled in the art to which it pertains, what I claim as new and desire to secure by Letters Patent of the United States is:

A pipe pusher, comprising a base member having upturned longitudinal side flanges, a carriage slidably mounted in the base member

between said flanges and having a rack at each side, weighted dogs pivotally mounted in the carriage for gripping a pipe therein, spaced apart U-shape pawl levers pivoted to the opposite side flanges of the base member and straddling the base member and said carriage, pawls pivoted to the opposite inner sides of said pawl levers in line and for engagement with said racks of the carriage to advance the latter in the base member, said pawls being symmetrical and adapted to be swung to opposite sides of their pivots to change the direction of advancement of the carriage, a U-shape handle pivoted to the opposite side flanges of the base member between the pawl levers and straddling the base and carriage, and side links connecting the opposite sides of the handle to the opposite sides of the pawl levers to simultaneously actuate all of the pawls from the handle.

In testimony whereof I affix my signature.

CLYDE R. HARDING.