

BELL SYSTEM PRACTICES  
Motor Vehicles and  
Construction Apparatus

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## CONSTRUCTION APPARATUS

### OPERATION OF WINCH LINE PIPE PUSHER

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#### 1. SCOPE

1.01 This section covers the operation of the winch line pipe pusher which is for use in pushing the larger sizes of pipe such as are employed in the construction of underground and buried cable plant. As 3-inch pipe is the size most commonly used, this size only is covered. Other sizes can of course be pushed in a similar manner, but as is explained herein, they will require a different size adapter and pilot.

## 2. EQUIPMENT REQUIRED

2.01 The following items of equipment are ordinarily required. The number after each refers to the particular paragraph explaining the purpose of the item.

Gin (3.01)

Pilot for size of pipe to be pushed (4.01)

Adapter for size of pipe to be pushed (5.01)

Connector (6.01)

Tools, barricades, etc. for use in connection with digging and backfilling the required excavations (7.01)

Two 2" x 12" x 24" plank anchors (7.03)

The necessary number of threaded pipe sections 10 feet long with a standard pipe coupling at one end of each (7.04)

Standard 8-inch wire rope snatch block (7.04)

Winch equipped construction truck with 7/16" winch line (7.05)

Wheel chocks (7.05)

Three sighting rods (3-foot duct rods are satisfactory) (8.01)

Two digging bars (9.01)

Two 3-foot chain pipe wrenches (10.01)

3-foot Stillson wrench (10.01)

If pipe is to be withdrawn after completing push, a coil of .109 galvanized iron wire (11.01) and a chain such as the light pole jack chain (11.02)

When pushing in sand, duct rods with sand scoop attachment (12.02)

## 3. DESCRIPTION OF PUSHER

3.01 The winch line pipe pusher, Fig. 1, consists of a gin, a pilot, an adapter and a connector. The gin consists of a 6" x 6" wooden strut about 14 feet long, one end of which carries two 8-inch wire rope sheaves. The other end carries a fabricated steel bearing plate. The pipe pushing device is employed to facilitate the utilization of the engine power of a winch-equipped construction truck for pushing pipe. The pilot, adapter and connector are described in Paragraphs 4.01, 5.01 and 6.01, respectively.

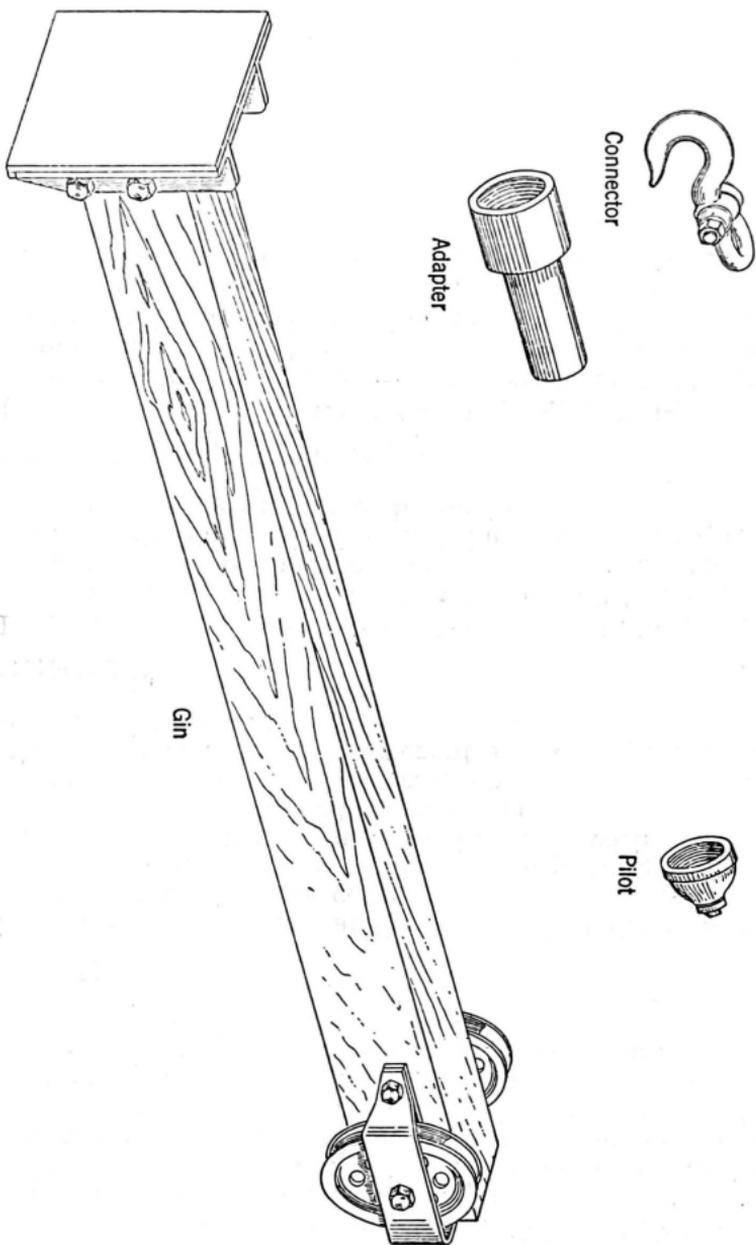


Fig. 1

#### 4. PILOTS

4.01 Except when pushing pipe in sand, place a pilot on the front end of the pipe. A commercial 3" x 1" malleable iron reducer with a pipe plug screwed into the small end is satisfactory for use as a pilot on 3-inch pipe. Such a pilot is furnished as part of the pipe pusher. For a different size of pipe use a pilot of suitable size. Avoid the use of pointed or streamlined pilots as they are too easily deflected and do not maintain good direction. If after the pipe is pushed, it is to be removed, the 5/16-inch diameter hole drilled through the head of the pipe plug in the pilot facilitates fastening a fish wire which should be pulled into the hole in the ground behind the pipe as it is pulled back out of the ground.

#### 5. ADAPTERS

5.01 An adapter is used at the rear end of the pipe in order to protect the pipe coupling and its threads from being damaged by the winch rope tackle used in pushing. For 3" pipe, a piece of 2-1/2" extra strong pipe 12" long with a 2-1/2" x 3" flush bushing and a standard 3" pipe coupling at one end should satisfactorily serve as an adapter. Such an adapter is furnished with the pipe pusher. For a different size of pipe use a similar adapter of suitable size.

#### 6. CONNECTOR

6.01 A connector consisting of a sling chain hook and a round pin anchor shackle with a 1-1/8" shackle bolt is furnished as part of the pipe pusher. It is used to facilitate connecting a standard 8-inch snatch block to the adapter at the rear end of the pipe section to be pushed.

#### 7. SETTING UP PIPE PUSHER

7.01 A trench about 14-1/2 feet long and 20 inches wide is dug in line with the proposed cable run. The depth of the trench should be about 6 inches greater than the depth desired to the bottom of the pipe, except at the ends where it should be deeper as shown in Fig. 2. It will also be necessary to dig a pit at the point to which the pipe is to be pushed.

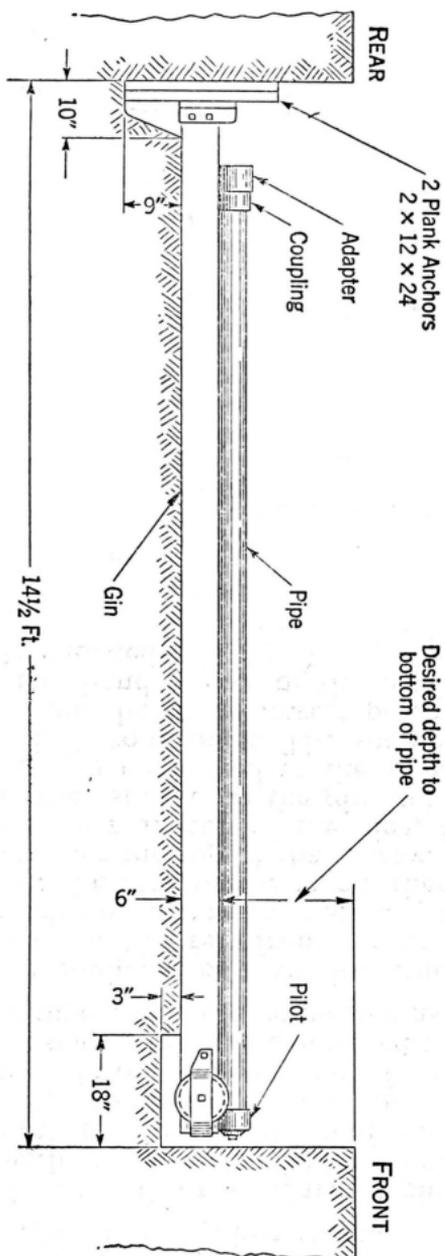


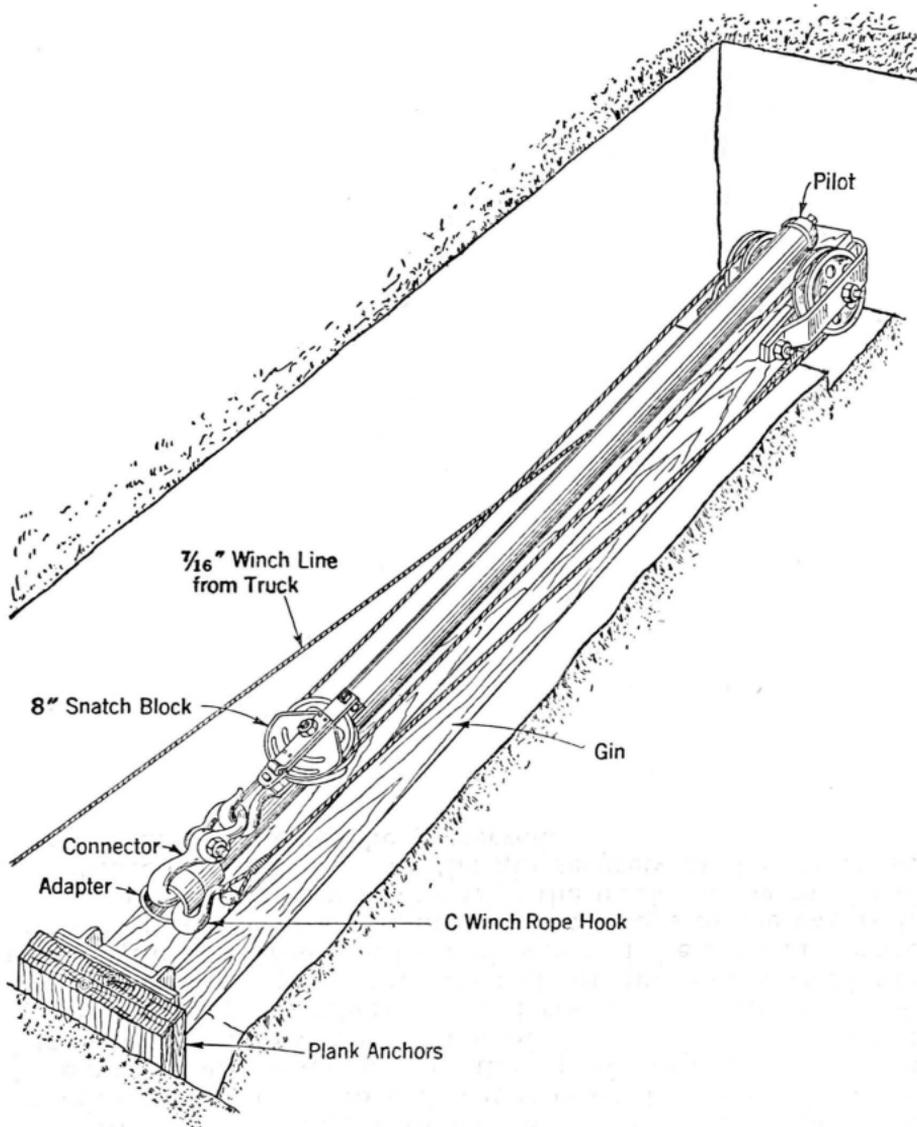
Fig. 2

7.02 The gin is placed on the bottom of the trench with its sheaves at the front end of the trench.

7.03 Two plank anchors, 2" x 12" x 24", one behind the other, are placed vertically against the rear end wall of the trench and the gin butted against them.

7.04 A ten-foot length of standard 3" pipe, threaded at both ends, with a pilot attached to one end, and a pipe coupling at the other, is placed on top of the gin along its center line with the pilot toward the front end of the trench. The adapter is slipped into the open end of the pipe. A standard 8-inch wire rope snatch block is connected to the adapter at the rear end of the pipe using the connector as shown in Fig. 3.

7.05 A winch equipped construction truck is placed in line with and about 25 feet from the rear end of the trench. A 7/16-inch winch line from the truck is passed, first over the type B sheave at the rear of the truck, then under one sheave on the gin, back over the top of that sheave through the 8-inch snatch block at the rear end of the pipe, forward again over the top of the other sheave on the gin and back to the end of the pipe, where it is connected to the adapter by means of a standard "C" winch rope hook. The spindle for the B sheave on the truck should be in its lowest position and the spindle support used. The hand brakes of the truck should be applied and the wheels chocked.



**Fig. 3**

## 8. ALIGNING PIPE PUSHER

8.01 The degree of success in attaining the desired direction of the pipe will depend in a very large measure upon the accuracy with which the pipe and gin are aimed before starting the push. A satisfactory procedure is to use three rods, such as duct rods, of exactly equal length. Hold two of them vertically with their lower ends resting upon the pipe, one near the rear end of the pipe and the other near the front end. Hold the third rod vertically, with its lower end resting upon the ground, over the point to which it is desired to push the pipe. Make a mark at a distance from the top of this rod equal to the distance desired between the top of the pipe and the ground surface at the point where the rod rests, as shown in Fig. 4. Sight along the tops of the two rods on the pipe toward the mark on the third rod. Shift the direction of the gin and elevate one end or the other as required until the tops of the two rods on the pipe are exactly in line with the mark on the third rod as indicated in Fig. 4. Block the gin securely in the trench so that this alignment will be preserved.

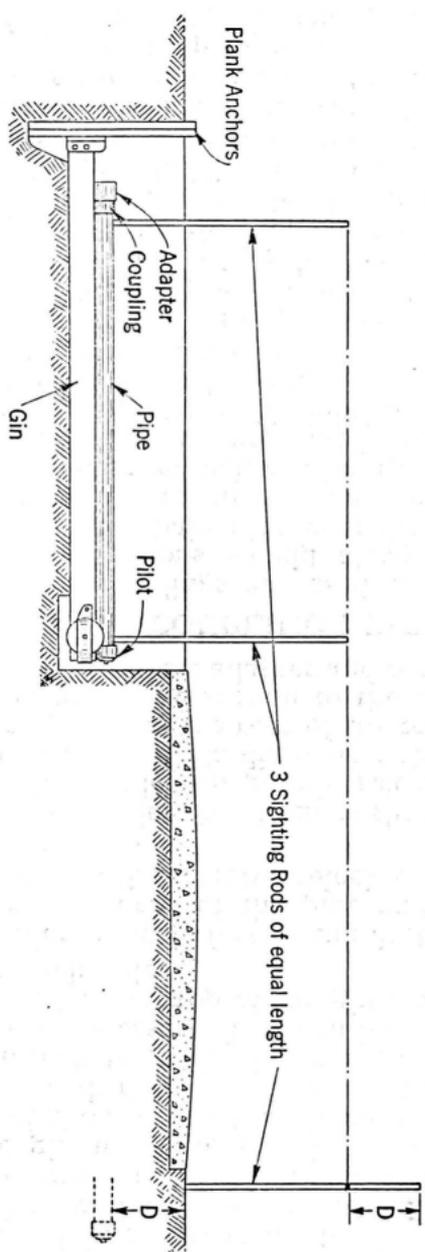


Fig. 4

## 9. PUSHING PIPE

9.01 After the apparatus has been set up and placed in proper alignment as covered in Parts 7 and 8, take up on the winch line. At first there may be a tendency for the gin to rise at its front end, the degree of tendency depending upon the slope of the winch line back to the truck. Ordinarily this can be counteracted by two men standing at the top of the trench near its front end, one on each side, and bearing down on the front end of the gin using digging bars. After the pipe has entered the ground about 3 feet this should no longer be necessary. The two men with the digging bars can now move toward the rear of the trench to guide the rear end of the pipe with their digging bars, if necessary. This can be done by resting the ends of the digging bars on top of the gin close to the sides of the pipe, one on each side.

9.02 After pushing about 5 feet of the first section, carefully check the alignment of the pipe and if necessary re-align as covered in Part 8, securely reblock the gin in place and proceed with the pushing.

9.03 When a pipe section has been pushed into the ground as far as the tackle will permit, release the tension on the winch line so that it is slack, disconnect the tackle from the end of the pipe and pull it to the rear of the trench. Remove the adapter, couple the next pipe section to the one in the ground as covered in Part 10, insert the adapter and reconnect the tackle.

## 10. COUPLING AND UNCOUPLING PIPE SECTIONS

10.01 Standard pipe couplings are used to connect the pipe sections. The sections should always be screwed up tight. 3-foot Stillson and chain pipe wrenches are suitable for doing this work. A chain wrench is ordinarily used for turning while a Stillson or a chain wrench can be used for holding. The pipe in the ground should be prevented from turning when screwing up a pipe section. A suitable lubricant, such as a heavy engine oil or light grease, should be applied to the pipe threads to make the screwing operation easier.

10.02 Care should be exercised in starting connections to prevent threads from becoming crossed and, as a result, damaged. A satisfactory procedure in coupling sections is to have two men straddling the pipe, one at each end. The man at the joint should hold the pipe cradled in his hands to guide it while the man at the rear holding the pipe between his hands aligns it with the section in the ground, turns it backward (to the left) until the threads are in line (indicated by a slight audible click) and then turns the pipe carefully to the right to engage the threads. Screw the pipe up by hand until it is certain that the threads are fully and properly engaged. Then screw the

pipe tightly into the coupling using a chain wrench on the pipe near the coupling while preventing the pipe section in the ground from turning, with a Stillson or chain wrench. Best results are ordinarily obtained when the wrenches are applied near the pipe joint.

10.03 When disconnecting pipe, hold the coupling on the pipe section in the ground with a wrench to prevent it from turning while unscrewing the section being disconnected. If this is not done one of the joints in the ground may become loose and eventually disconnected. Care should be exercised to see that the pipe is properly supported while the last few turns are made in unscrewing in order to prevent damage to the threads when the sections part.

## **11. WITHDRAWING PIPE**

11.01 If the pipe is not to be used as a conduit, but is to be removed and the cable pulled into the hole, as might be the case with buried cable, the cable can be pulled in as the pipe is withdrawn. If the cable is to be pulled in later, a fish wire should be pulled into the hole as the pipe is withdrawn. This fish wire will later be used to draw in the winch line.

11.02 To withdraw the pipe attach a sling around the pipe. The light pole jack chain can be used for this purpose. Attach the winch line from the truck to the sling and pull out the section until a sufficient portion of the next section is exposed to permit attaching the sling to it. Uncouple the pipe as covered in 10.03. If the pipe is at a shallow depth, and space and other conditions permit, all the pipe can be pulled out in one operation and uncoupled on the ground later. If the depth of the pipe is 2 feet or more, it is advisable to uncouple each section in the trench to prevent permanent bending of the pipe or breakage near the threaded ends which may occur when it is pulled upward over the rear end of the trench.

## **12. PUSHING IN SAND**

12.01 When pushing in sand it is often impossible to push the entire desired distance with a pilot on the front end of the pipe. In such cases leave the front end of the pipe open by omitting the pilot.

12.02 Push the pipe as when working in clay or loam, but without pilot until no further progress can be made. Remove the tackle and adapter from the end of the pipe and with duct rods and sand scoop remove the sand in the pipe. If necessary remove some sand from beyond the front end of the pipe, exercising care to avoid the removal of more sand than is necessary. Usually after the removal of only a comparatively small amount the pushing can be resumed for an appreciable distance before additional sand need be removed.

12.03 If the pipe is to be left in the ground for use as a conduit, thoroughly clean out all sand. Hosing with water, if available, should prove effective in cleaning out the sand.

### 13. GENERAL PRECAUTIONS

13.01 See that the path selected for the pipe does not pass through any subsurface structures such as gas, water, sewer and electric conduit systems. Where such structures exist, be sure that the required clearances will be obtained.

13.02 Obtain all the necessary permits for performing the required operations and have on hand at all times those which may be needed on the job for reference.

13.03 When pushing pipe in sand or any other relatively incompressible soil under paved surfaces place the pipe deep enough to prevent buckling of the pavement. If this is impracticable remove sufficient sand to make the pushing relatively easy. If no material is removed when pushing pipe 18 inches or less below paved surfaces in sand the pressure exerted, because of the relative incompressibility of the sand, may be great enough to burst thin concrete pavements such as are used for sidewalks and brick or wood block street pavements.

13.04 When the job is completed, backfill, tamp and if necessary repave in accordance with established practices and in compliance with any local regulations governing this work.

### 14. SAFETY PRECAUTIONS

14.01 Rope off or barricade the space between the back of the truck and the trench.

14.02 See that all open trenches or excavations are properly barricaded at all times and that all required warning signs and lights are placed.

14.03 Keep hands off winch line, blocks and tackle while they are under tension or in motion.

14.04 See that all persons are clear of the winch rope at all times, except workmen guiding pipe into ground at start of push (9.01). Be particularly careful when making angular pulls to see that no one is in a position where he might be struck by the winch line, blocks, or other equipment under strain in case something unusual should happen.

14.05 Do not stay in the trench while the pushing operation is in progress.

14.06 All in the crew should be familiar with the system of signals established for the use of outside plant forces and thoroughly understand by whom they are to be given in connection with the different operations to be performed.