2 Sheets--Sheet 1.

F. DICKENSON, Jr.

Improvement in Manufacture of Drain-Pipe.

No. 128,369. Patented June 25, 1872.

Fig: 1.

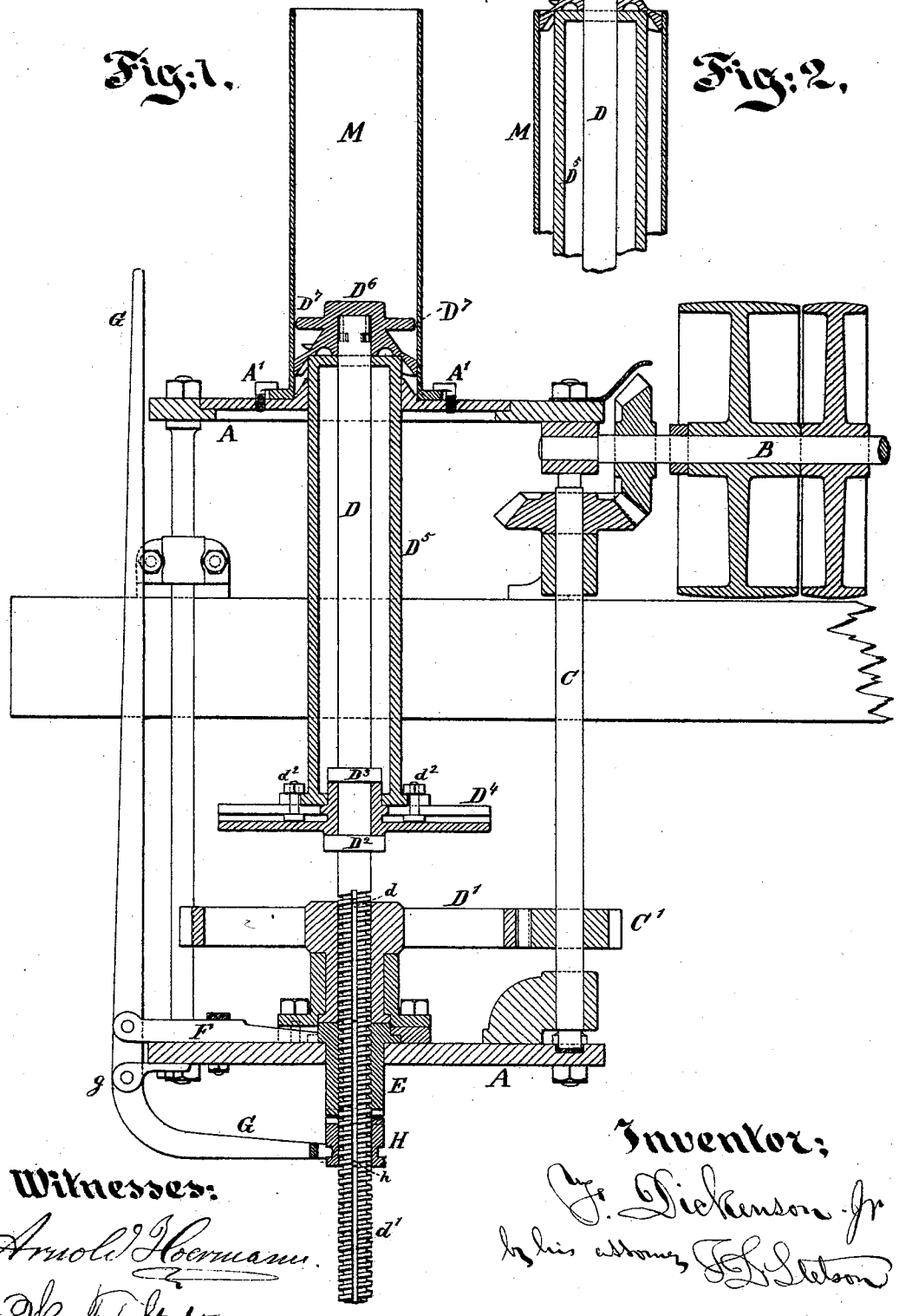

Fig: 2.

Witnesses:

Arnold Hoemans.

W. F. Stetson

Inventor:

F. Dickenson Jr

by his attorney F. L. Stetson

2 Sheets--Sheet 2.

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Fig: 3.

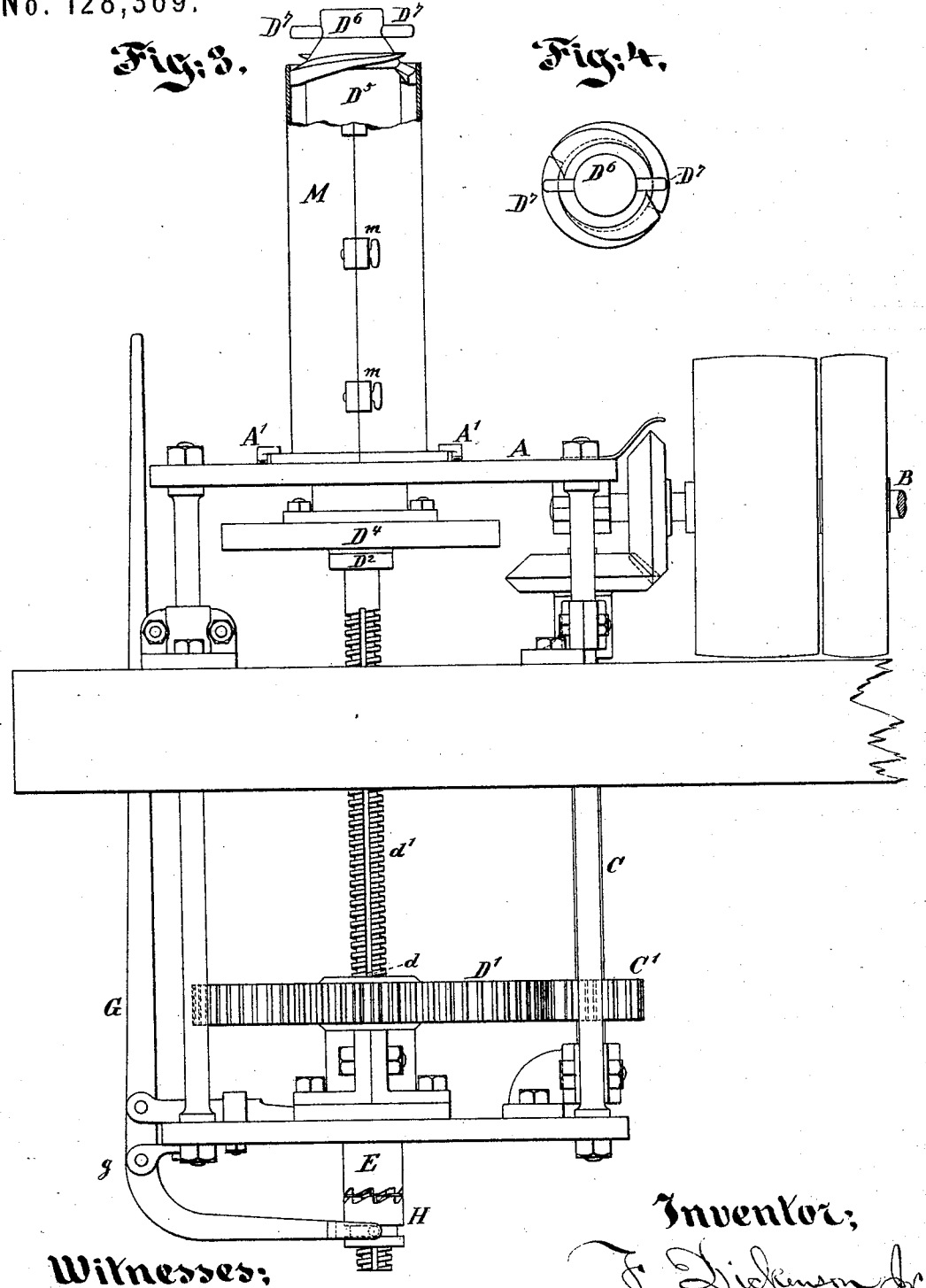

Fig: 4.

Witnesses:

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Inventor:

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by his attorney F. F. Stetson

UNITED STATES PATENT OFFICE.

FERDINAND DICKENSON, JR., OF HARTFORD, CONNECTICUT, ASSIGNOR TO HIMSELF AND J. E. COLEMAN, OF SAME PLACE.

IMPROVEMENT IN THE MANUFACTURE OF DRAIN-PIPES.

Specification forming part of Letters Patent No. 128,369, dated June 25, 1872.

Specification describing an Improvement in the Manufacture of Drain-Pipes, invented by FERDINAND DICKENSON, Jr., of the city and county of Hartford, in the State of Connecticut.

The improvement relates to means whereby I compress or compact together the material with a high degree of force and uniformity. I produce the complete sections of pipe with the ends properly formed for joining together, requiring little labor or skill. I can employ a mixture of Rosendale cement or analogous fat lime, generally termed water-lime, with sand, employing liberal admixtures of coarser flinty particles or gravel to economise the material. I can employ any of the mixtures of these or other materials which have been heretofore used in the manufacture of cement pipes. I believe that I can employ clays of various kinds, and can manufacture by my means pipes thereof which require burning in kilns to make them properly durable; but I will describe the invention as applied to the manufacture of cement pipes.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawing forms a part of this specification.

Figure 1 is a central vertical section with the core and its attachments in their lowest position. Fig. 2 is a corresponding section of a portion with the core in its highest position. Fig. 3 is a side elevation with a portion of the removable casing broken away to show the core and its attachments within. Fig. 4 is a plan view of the winged piece which is carried on the top of the core.

Similar letters of reference indicate corresponding parts in all the figures.

A is a rigid frame-work or foundation, which affords a support for the several parts, as will be obvious. B is a driving-shaft, receiving through belts or fast and loose pulleys, or otherwise, a rotatory motion in opposite directions, at will. The gearing represented communicates this motion to the upright shaft C, and the small gear-wheel C^1 thereon gives motion to the large gear-wheel D^1, which, by means of the spline-key *d*, gives motion to the shaft D. This shaft is the instrument through which several important functions are performed. The collars D^2 D^3, above the screw-thread d^1, receive and confine between them the boss or central hub of a horizontal wheel, D^4, which turns therewith and rises and sinks therewith, as the screw-thread d^1 shall require, by traversing in the long nut E mounted below. This nut E is, under some conditions, liberated and allowed to turn with the screw, but will for the present be understood to be held in a fixed position, so that as the shaft D is revolved it shall rise or sink slowly. The horizontal wheel D^4 carries, by means of bolts d^2, a tall hollow casting marked D^5, which I term a core. It performs the function of holding out the material and shaping the interior of the pipe. Its upper end carries a removable piece marked D^6, which is peculiar and important. This piece D^6 is adapted to be locked and removed at pleasure, by means of a bayonet-joint connection, to the upper projecting end of the shaft D. It is provided with helical blades analogous to the blades of a screw-propeller, but, preferably, extending further around. I prefer to employ two of these blades; but one may serve, or a greater number may be employed, if preferred. As the shaft D revolves in the proper direction the screw-blades—which I will designate by the general letter D^6—take hold of any material which is presented to them and compress it or compact it downward with great force. It will be observed that they do not extend out horizontally, but droop at an angle of about forty-five degrees. M is a movable casing, which may be formed of rolled iron, steel, or analogous material, having a joint or opening on one side provided with legs or fastenings; or there may be continuous flanges along those edges if preferred, by which the joint may be tightly and strongly secured and again liberated at pleasure. The entire casing M, with its fastenings *m*, is adapted to be secured down by engaging under the stout hooks A′, fixed on the frame, as represented. The case M may be readily disengaged by partially turning it around on its seat, and, after the pipe is formed therein, may be lifted with its inclosed material and carried away and opened and a new case substituted in its place. The entire shaft D, with its attached core D^5, is lowered previous to the applying of an empty case, M,

and the screw-top D^6 being properly secured in position, the case M is applied and fastened, and a quantity of the previously-mixed damp material is supplied through the open top. The machinery being now set in operation, the shaft D is turned, and the screw-winged piece D^6 commences its revolution in the bottom of the semi-plastic mass, catching hold of the several particles within its range and crowding them forcibly down. The adjacent surface of the framing is formed conical, as shown, immediately embracing the core D^5 so as to give the desired hollow conical form to the compressed material. As the winged piece D^6 catches successive quantities of the plastic material and crowds it forcibly down, the screw-thread d^1, acting within the nut E, raises it slowly, so that at each revolution a thin and tightly-compacted layer is compressed and firmly united with the previously-compressed material below. Thus the pipe is rapidly built up by successive increments, uniformly and forcibly packed by the action of the screw D^6, until the whole has mounted to or near the extreme top of the casing M. The under side of the screw-piece D^6 is conical near its periphery, and properly formed to impart just the right shape to the finished end of the compressed pipe. It can be held steady at the proper level for a little time and allowed to revolve there. This is effected at the proper juncture by liberating the nut E, as before suggested. F is a sliding bolt mounted in suitable guides in the framing, and adapted to match into one or more notches in the periphery of the nut E. Its outer end is pivoted to the hand-lever G, which turns upon a fixed center, *g*. The attendant, by moving this hand-lever G a little distance, detaches the bolt F from the nut E, and the nut E, thereupon turning with the screw D, allows the screw and its attachments to revolve a dozen times, more or less, at a fixed level. This operation finishes the upper end of the pipe and causes it to match exactly to the hollow end of the next one, when they are applied together for use. I believe it practicable to operate with some success without the further provision shown for insuring the rotation of the nut E. But I will describe the provision which I have used and esteem important to guarantee that the motion of the nut shall be uniform with that of the screw when desired, and this is the clutch H, which is mounted on the screw-shaft D at a little lower level, and is caused to revolve therewith by means of a spline-key, *h*. The upper face of this clutch H and the lower face of the nut being toothed and properly adapted to each other, an extension of the lever G, taking hold of the clutch-piece H, causes it to rise and engage with the nut at the same moment that the bolt F is withdrawn. Now, by giving sufficient motion to the hand-lever G it will be seen that the nut is first liberated by the removal of the bolt F, and then immediately after engaged by the clutch H and compelled to turn with the screw D. The pipe may be made of any thickness desired. The ratio of the diameter of the interior core to the diameter of the entire pipe may vary within wide limits. I have represented about the proportion generally employed in drain-pipe. The exterior casing M may, if preferred, be made of cast-iron or other material, and may be made in two halves, or in a greater number of sections, like the staves of a barrel, if preferred for any reason. So, also, the interior core D^5 may be variously constructed.

I have represented what I esteem a proper and desirable construction. However these parts are formed, they are liable to be exposed to very considerable strains. The compression induced by my screw-piece D^6 is and ought to be quite powerful. It is obviously much more efficient by acting on a few particles or a thin layer at a time, instead of acting through a great mass at the same moment; but the peculiar operation does not relieve the exterior and interior walls of the forming mass from a considerable pressure.

I have found, in practice, that a core, D^5, having a diameter equal to two-thirds the entire diameter of the pipe, on being thrust up into the loosely-deposited mass of mixed material does not cause a rise of the surface of the soft material to as great an extent as its displacement would seem to require. I ascribe this to the close packing of the particles. In fact, in making pipe of a fair thickness the casing M is filled nearly full at the commencement, while the core D^5 is in its lowest position, and as the core rises, very little of the material is ultimately forced out at the top. Nearly all of the entire contents is retained in the form of a closely-compacted pipe.

The action of the drooping wings on the piece D^6 not only compresses the material by small successive increments or layers, and leaves it with a proper incline for the male end of the pipe, with a uniformity of action from the extreme opposite end to which the droop allows it to match exactly, but also draws the material inward by acting thus obliquely upon it, so as to counteract the tendency to press it outward too forcibly against the interior of the casing. The ordinary form of screw-wings press it out against the case more forcibly than against the core. My form compresses it about equally in both directions, and makes the outer and inner surfaces about equally dense, but with a slight excess of density and smoothness on the inner surface where it is most needed.

When the section of pipe is finished, so far as its production within the casing M and between it and the core D^5 is concerned, its removal must be next attended to. Stopping the machinery entirely I disengage the top piece, which I have designated the screw piece D^6, by turning it partially around on the shaft D and lifting it off. The projections D^7, represented just above the screw-wings on the piece D^6, serve the double function of handles to lift it by at this stage, and of mixers to aid in agitating the plastic mass as it comes up

through it. Having thus removed the top piece, I set the machinery in motion in the opposite direction, employing a belt-shipper or analogous device, not represented; and turning the shaft D in the opposite direction from the motion which was first imparted to it, the action of the threads d^1 now runs it down through the nut E in the same manner as it previously ran it up.

The motion in thus sinking down and drawing out the core from the finished pipe I believe may be more rapid than that by which it was elevated, and thus a little time may be saved under some circumstances; but in my experiments I have run it down with the same slow motion with which it was elevated. When, as will usually be the case, the work is run by a single small engine or pair of engines without a governor the speed may be increased to any degree which may be convenient in running down the core. So soon as the core is withdrawn the case M may be liberated by partially turning it or otherwise unlocking it from the holding-hooks A′, and the case with its contained length of pipe may then be loaded on a cart or car to carry away to the drying-floor; and the top piece D^6 being applied and locked on the top of the core and of the shaft D, a fresh case, M, may be applied and filled or nearly filled, and the operation repeated.

The wheel D^4 is formed with radial grooves, which allow the locking-bolts d^2 to be moved outward and inward to any desired extent to allow of an exchange of cores. I can vary the size of the cores D^5 within wide limits by simply changing the portion of the framing immediately surrounding, and which should fit closely thereto.

In the working of some compounds of materials, and in the manufacture of some sizes of pipes, it may be desirable to avoid the continuous rotatory motion of the core D^5. In such case I mount the wheel D^4 loosely on the shaft D, allowing it to turn freely between the collars D^2 and D^3, and provide a vertical guide engaging in a notch in the edge of the wheel D^4, or other suitable means to prevent the core from rotating. Care should be taken under such working to furnish the joint at the top, between the core D^5 and the screw-piece D^6, with leather packing or other efficient means for preventing the clogging of the joint with the material which is being worked. The joint should be tightened easily, so that the screw piece D^6, receiving powerful and continuous rotatory motion as before from the revolving shaft D, shall gradually climb through the mass of material and compact it down in the annular space around the core, while the core shall perform the same functions as before—of holding it out to its proper place after it has been thus compacted—without the rotatory motion.

I can work the machine in various other positions, and with various other proportions of the parts than are here represented. The machine may be worked with the shaft in a horizontal or in various inclined positions instead of an upright position. It may be preferred for some uses to give a rotatory motion to the external casing M, making its interior very smooth, and revolving it by suitable machinery in the direction opposite to that of the internal core and of the screw-piece.

Some of the advantages due to certain features of my invention may be separately enumerated, as follows: First, by reason of the fact that the screw-wings D^6, which compress the material by small increments, have an incline or drooping form on their under surfaces, I am able to give the pipe the uniform density and hardness due to the action of the screw-wings, and consequently a high degree of strength and soundness, and the tendency is to leave the body of the pipe uniformly compressed on its inner and outer surfaces, and also with the proper taper for the male end of the pipe. Second, by reason of the screw-thread d' working within the nut E below the core D^5, and the winged screw piece D^6 working in the plastic material, I am able, by convenient mechanism, to regulate with uniformity the rate of ascent of the screw piece through the soft material, and to insure that the layers compressed thereby are uniform and regular. Third, by reason of the unlocking device F and its operating means I am able to liberate the nut E at the proper period and allow the shaft D to turn at a given level, and thus, by means of the winged piece D^6, to give a superior finish to the upper or male end of the pipe, and again to engage the screw conveniently when it is necessary to lower the core. Fourth, by reason of the clutch piece H and the lever G, operating as shown, I am able to insure the turning of the nut E uniformly with the shaft D so soon as it is liberated by the disengagement of the bolt F, and to insure its release again just prior to its being again relocked. Fifth, by reason of the handles D^7, as arranged on the screw-piece D^6, I am able to conveniently handle the screw piece by hand or by any suitable apparatus in taking it off and putting it on and securing it; and also to effect the entirely distinct and important function of stirring and kneading the material in advance of the action of the screw-wings.

I claim as my invention—

1. The screw-wings D^6, having their under surfaces drooped to correspond with the core required for the male end of the pipe, and operating in the annular space between the casing M and the core D^5, substantially as herein specified.

2. The screw-thread d', nut E, and revolving shaft D, arranged below the core D^5, and winged screw-piece D^6, and adapted to operate relatively to each other and to the plastic material in the casing M or its equivalent, substantially as specified.

3. The locking and unlocking device F with its operating means, arranged to serve, as rep-

resented, relatively to the nut E, shaft D d^1, and winged top piece D^6, for the purposes specified.

4. The clutch piece H, arranged to operate relatively to the nut E, liberating means F, and shaft D and its connections, substantially as and for the purposes herein specified.

5. The radial arms D^7 on the removable screw piece D^6, arranged, as shown, and adapted to serve both as handles and as kneaders for the material prior to the action of the screw-wings, as specified.

In testimony whereof I have hereunto set my name in presence of two subscribing witnesses.

FERDINAND DICKENSON, JR.

Witnesses:
S. D. SPERRY,
W. H. CHAMPLIN.