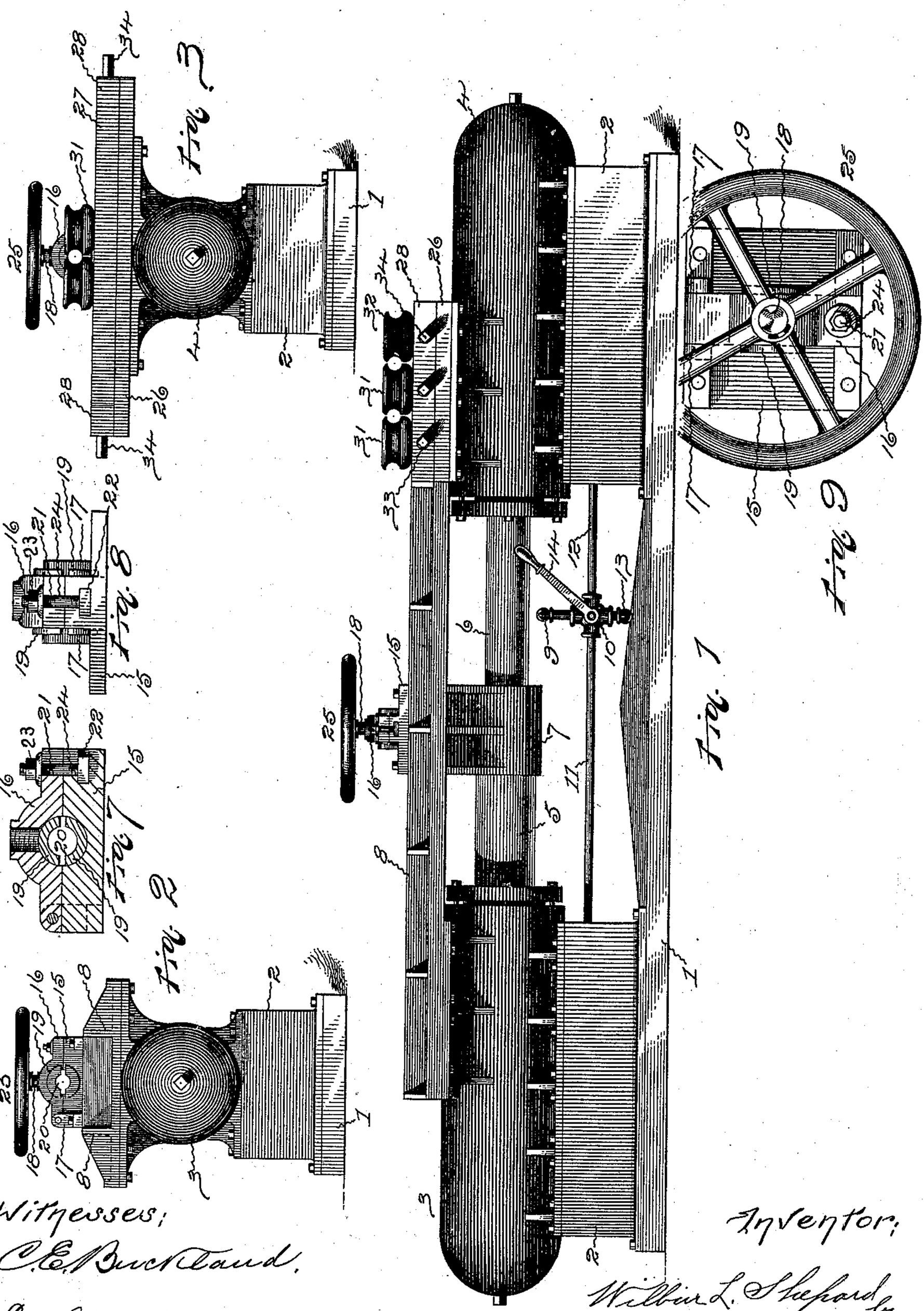
(No Model.)

2 Sheets—Sheet 1.

W. L. SHEPARD.

HYDRAULIC BENDING MACHINE.

No. 550,766. Patented Dec. 3, 1895.



Witnesses;
C. E. Buckland.
E. J. Hyde.

Inventor;
Wilbur L. Shepard by,
Warren P. Williams
atty.

ANDREW B. GRAHAM, PHOTO-LITHO, WASHINGTON, D.C.

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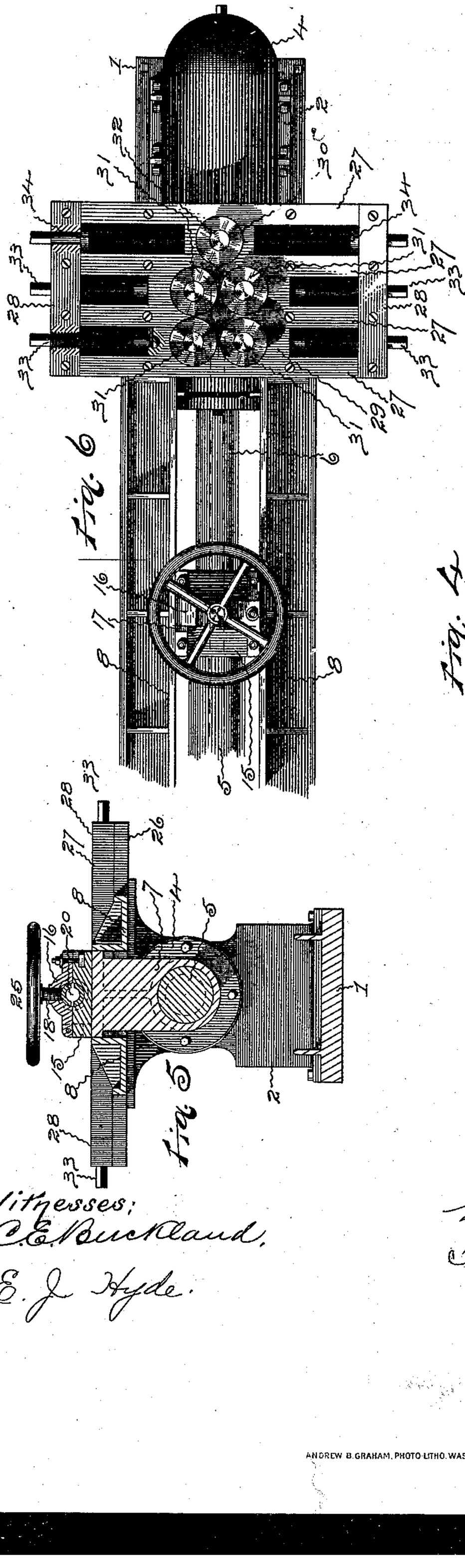

Fig. 1.

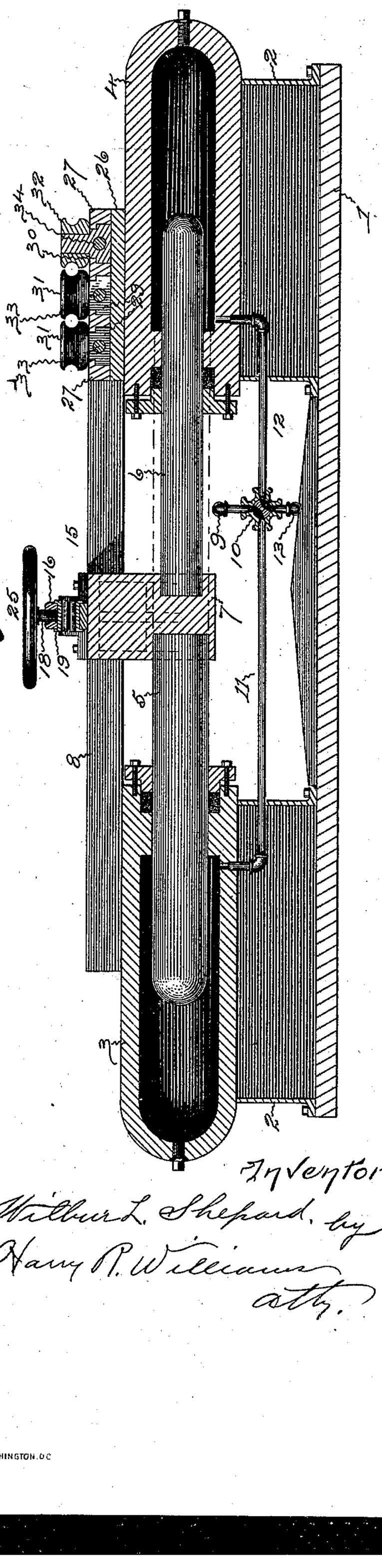

Fig. 2.

Fig. 3.

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atty.

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

UNITED STATES PATENT OFFICE.

WILBUR L. SHEPARD, OF ELMWOOD, CONNECTICUT, ASSIGNOR TO THE WHITLOCK COIL PIPE COMPANY, OF SAME PLACE.

HYDRAULIC BENDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 550,766, dated December 3, 1895.

Application filed February 26, 1894. Renewed May 23, 1895. Serial No. 550,459. (No model.)

To all whom it may concern:

Be it known that I, WILBUR L. SHEPARD, a citizen of the United States, residing at Elmwood, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Hydraulic Bending-Machines, of which the following is a specification.

The invention relates to the class of hydraulic machines for bending or coiling pipe, tubing, or rods of metal; and the object is to provide a very powerful machine of this class which shall be easy to operate and readily adjustable, so that coils of indefinite length and of different diameters can be quickly and readily formed of pipe, tubing, or rods of varying size.

Referring to the accompanying drawings, which illustrate the invention, Figure 1 is a side elevation of the machine. Fig. 2 is a view of one end, and Fig. 3 is a view of the opposite end. Fig. 4 is a central longitudinal section of the machine. Fig. 5 is a transverse section through the pipe-holding head. Fig. 6 is a plan of a portion of the machine. Fig. 7 is an enlarged detail section of the pipe-holding head. Fig. 8 is an enlarged end view, and Fig. 9 is an enlarged plan, of the same.

In the views, 1 indicates a base-plate, near each end of which are beds 2, supporting cylinders 3 and 4. These cylinders, which are made very strong to suitably stand heavy hydraulic pressure and are placed facing each other, preferably have different interior diameters and are provided with plungers or rams 5 and 6, of different size, the larger ram 5 working in the larger cylinder 3 and the smaller ram 6 working in the smaller cylinder 4, both, of course, being properly packed to prevent leakage. The rams, which work toward each other in the same line, are shown as connected by a block or head 7, that is free to move longitudinally of the machine along the guideways 8 between the cylinders as the rams are operated, which guideways are supported at their ends by the cylinders, and this head is provided with a gripping device for grasping or clutching the pipe, tube, or rod that is to be bent; but of course, if desired, the rams may be formed from a single shaft that has its opposite ends projecting into the opposite facing cylinders, as illustrated by the dotted lines in Fig. 4.

Leading from any ordinary force-pump or other suitable source of hydraulic pressure is a pipe 9, that is provided with a controlling-valve 10, from which branches a pipe 11 to the cylinder 3, a pipe 12 to the cylinder 4, and an exhaust or escape pipe 13. This valve is preferably a four-way cock provided with a suitable operating lever or handle 14, and when it is turned in one direction the pressure from the pump will be admitted to one of the cylinders, while the other cylinder will be opened to the exhaust; but when it is turned in the opposite direction the conditions are reversed and the latter cylinder will be open to the pressure, while the former will be open to the exhaust, there being an intermediate position of the cock, however, whereby the pressure can be shut off from both of the cylinders, Figs. 1 and 4.

In the form shown the head for grasping and holding the pipe to be coiled consists of the block 7, that connects the rams, a small bed-plate 15, bolted or otherwise secured to the top of the block, and a top or cover plate 16, pivoted to ears or lugs 17 on the bed-plate, which cover-plate bears a screw 18 for forcing together the grasping jaws or sleeves 19, that hold the pipe. These sleeves 19 are semicircular pieces of varying size for holding pipes of different diameters that are placed in the opening 20, made partly in the top of the small bed-plate 15 and partly in the bottom of the cover-plate 16, which swings upon its pivot so as to open away from the bed-plate to allow sleeves of different size to be placed in position, according to the size of the pipe to be held, and also to permit the pipe to be laid in or removed from the grasp of these jaws or sleeves. The free end of this cover-plate is preferably held close to the bed-plate by a bolt 21, having its head loosely inserted in a socket 22 in the bed-plate, and its nut 23, that bears on the top of one end of the cover-plate, a slot 24 being cut in the ends of these parts, so that the bolt can be removed when the nut is loosened without completely unscrewing it. The gripping-sleeves 19 are usually flanged to prevent them from slip-

ping endwise from the opening in the head, and they are forced together, so as to bite the pipe placed between them, by turning the screw 18, that is provided with a lever or hand-wheel 25. It is very desirable in order to obtain a tight bite of the sleeves on the pipe that the hand-wheel be somewhat loosely connected with the spindle of the screw, as shown in Fig. 9, where a pin or key on the spindle works in a slot in the hub of the wheel, so that the screw can be tightened by a blow given by the momentum of the wheel as it moves free.

At the end of the guideways 8, that are strongly-braced lengths of angle-iron supported by the cylinder having the small ram, is the coiling-head with the adjustable bending forms, wheels, or rolls. The head shown consists of a plate 26, that is securely attached to the cylinder, on top of which is a frame formed of side bars 27 and end bars 28, that are so arranged as to leave between them runways that extend transversely of the machine. These side bars are undercut, and in the recesses or runways between them are placed a number of blocks 29 and 30, that can be moved transversely of the machine, which blocks have projecting pivots bearing the loosely-revolving grooved wheels or rolls 31 and 32. In two of these runways the blocks are put in pairs and each block is loosely connected with the end of a screw-threaded spindle 33, which spindles pass through threaded perforations in the end bars 28 and terminate in an end shaped for the application of a wrench or key, so that these spindles may be rotated and these pairs of blocks moved toward and from each other to open or close the distance between the rolls and adjust them for pipes, tubes, or rods of varying diameters, Fig. 6. A single block 30 is placed in the other runway, and this block has a threaded socket for the screw 34, that passes from end to end of the frame and rests loosely in perforations in the end bars, so that the roll 32 of this block may be drawn from side to side and left at any desired distance on either side of the center line between the other rolls in order to form a right or left coil of any diameter, as desired. This arrangement not only permits either a right or left coil to be turned of any number of turns of the predetermined diameter, but enables this roll 32 to be moved while the coiling is being done to change the diameter or even the direction of the turns of the coil being made.

A pipe of indefinite length that it is desired to coil is laid in the opening in the gripping-head with its end adjacent to the rolls. Then the head is closed and fastened and the holding-sleeves caused by the tightening-screw to bite the pipe. After adjusting the pairs of rolls according to the diameter of the pipe and the single roll to form a coil of the desired direction and required diameter the lever of the controlling-valve of the hydraulic system is turned so as to permit the pressure to be exerted on the larger ram, and this forces the head carrying the pipe forward and positively pushes the pipe between the rolls, which bend it as desired. When the head carrying the pipe has reached the limit of its forward movement, it can be arranged to strike the end of the lever of the controlling-valve and move it, as shown in Fig. 1, or this valve can be turned up by an attendant, so that the pressure will be exerted on the smaller ram instead of the larger, which is now open to the exhaust, so that the head will be carried back to its starting-place, the gripping device, of course, being loosened by the attendant before the return movement of the head commences, so that it will not carry back the pipe during the return and uncoil what has been coiled. After the head has returned to its starting-place and the pipe gripped in a new place the hydraulic pressure is again let into the larger cylinder and the operation repeated to continue the coiling. By this arrangement a very powerful pressure is exerted on the head, so that large pipe of indefinite length can be positively forced forward between the bending-rolls, which can be easily and quickly adjusted to form the diameter of the coil of any required size, and the pipe is readily grasped or released from the bite of the powerful holding-head, which is rapidly forced back to its starting-point to commence its forward movement for feeding a fresh section of the pipe to the coiling-rolls.

I claim as my invention—

1. A hydraulic bending machine consisting of a stationary bending head, a movable pipe holding head, a pair of oppositely facing hydraulic cylinders with a hydraulic ram projecting from one for forcing the holding head toward the bending head and a hydraulic ram projecting from the other for forcing the holding head away from the bending head, substantially as specified.

2. A hydraulic bending machine consisting of a stationary bending head, a movable pipe holding head and a compound hydraulic ram connected with the holding head, one end of said ram projecting into one cylinder and the opposite end of the ram projecting into another cylinder, substantially as specified.

3. A hydraulic bending machine consisting of a stationary bending head, a movable pipe holding head, a pair of oppositely facing hydraulic cylinders with rams of varying size for forcing the holding head toward and from the bending head, substantially as specified.

4. A hydraulic bending machine consisting of a stationary bending head, a movable pipe holding head, a ram working in a hydraulic cylinder for forcing the holding head toward the bending head, a ram working in a hydraulic cylinder for forcing the holding head away from the bending head, pipe connections between the cylinders and a forcing pump, and a valve in said pipe connection that when turned in one direction admits the

pressure to one cylinder and opens the other cylinder to the exhaust, and when turned in the opposite direction opens the former cylinder to the exhaust and admits the pressure to the latter cylinder, substantially as specified.

5. A hydraulic bending machine consisting of a stationary head provided with bending rolls, a movable head provided with pipe gripping jaws, and a compound hydraulic ram for forcing the holding head toward the bending rolls, and for forcing the holding head away from the bending rolls, substantially as specified.

6. A hydraulic bending machine consisting of a pair of hydraulic cylinders facing each other and provided with rams of varying size in line with each other and holding a pipe grasping head between them, a pipe grasping device secured to the movable head, and a head with bending rolls supported in the line of movement of the pipe grasping device, substantially as specified.

7. A hydraulic bending machine consisting of a pair of hydraulic cylinders provided with rams of varying size, a guide-way supported by the cylinders, a head for holding the pipe movable along the guide-way between the cylinders and carried by the rams, and a bending head supported by one of the cylinders at the end of the guide-ways, substantially as specified.

8. A hydraulic bending machine consisting of a pair of hydraulic cylinders provided with rams of varying size, a guide-way supported by the cylinders, a head for holding the pipe connected with the rams and movable along the guide-way from one cylinder to the other, and a bending head supported by one of the cylinders and provided with adjustable bending rolls, substantially as specified.

9. A hydraulic bending machine consisting of a pair of hydraulic cylinders provided with rams that operate in opposite directions, a guide-way supported by the cylinders, a head for gripping pipe connected with the rams and movable along the guide-way from one cylinder to the other, and a stationary bending head supported at one end of the guide-ways and provided with adjustable bending rolls, substantially as specified.

10. In combination with a hydraulic bending machine, a movable pipe gripping head connected with the hydraulic rams, said head having a bed plate with an opening and a pivoted cover plate with a coinciding opening, a removable fastening for holding the free end of the cover plate, and a screw for biting the pipe, substantially as specified.

11. In combination with a hydraulic bending machine, a head bearing several pairs of movable roll blocks, threaded spindles for moving the said blocks and an adjustable roll block movable either side of the line of the opening between the pairs of roll blocks with a screw for adjusting the same, substantially as specified.

WILBUR L. SHEPARD.

Witnesses:
H. R. WILLIAMS,
C. E. BUCKLAND.