

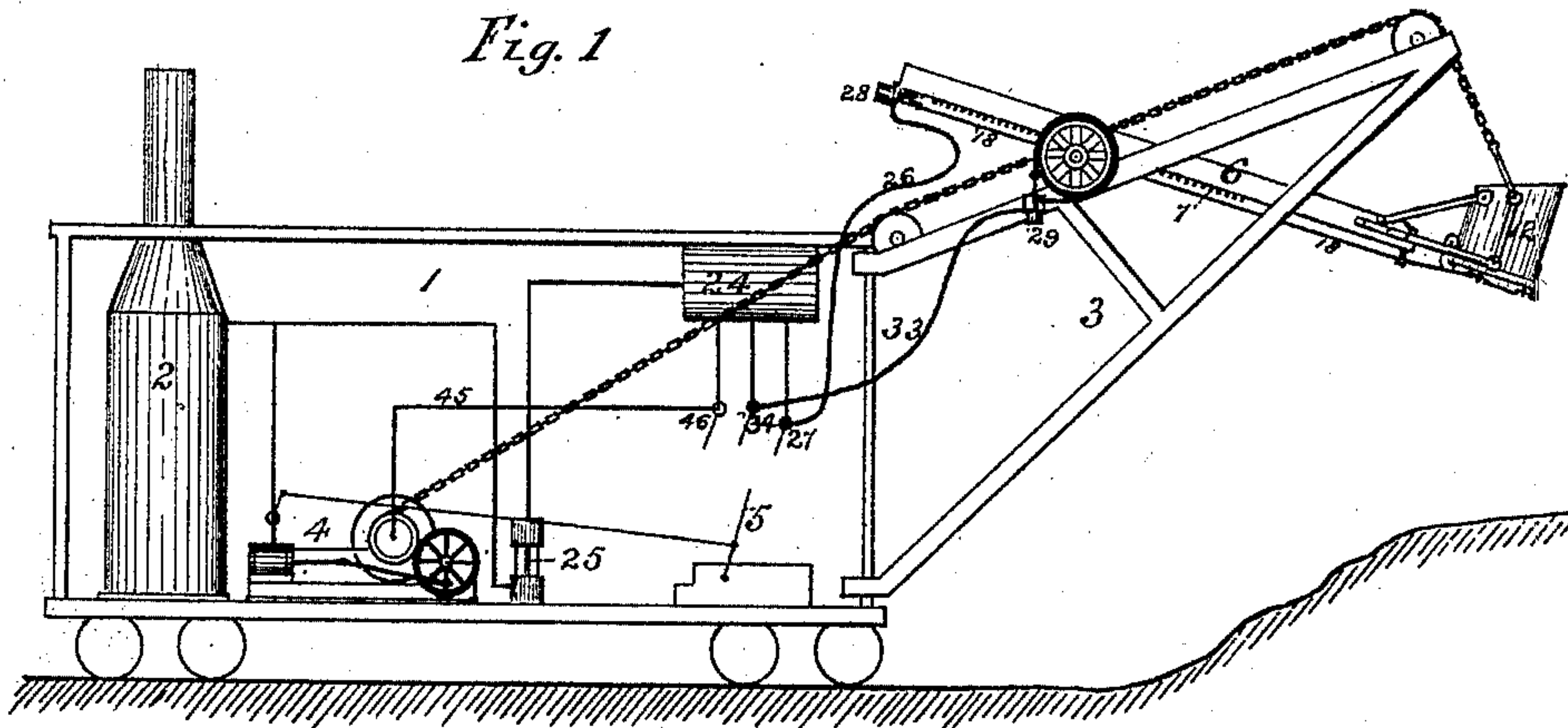
(No Model.)

J. NICHOL.  
STEAM SHOVEL.

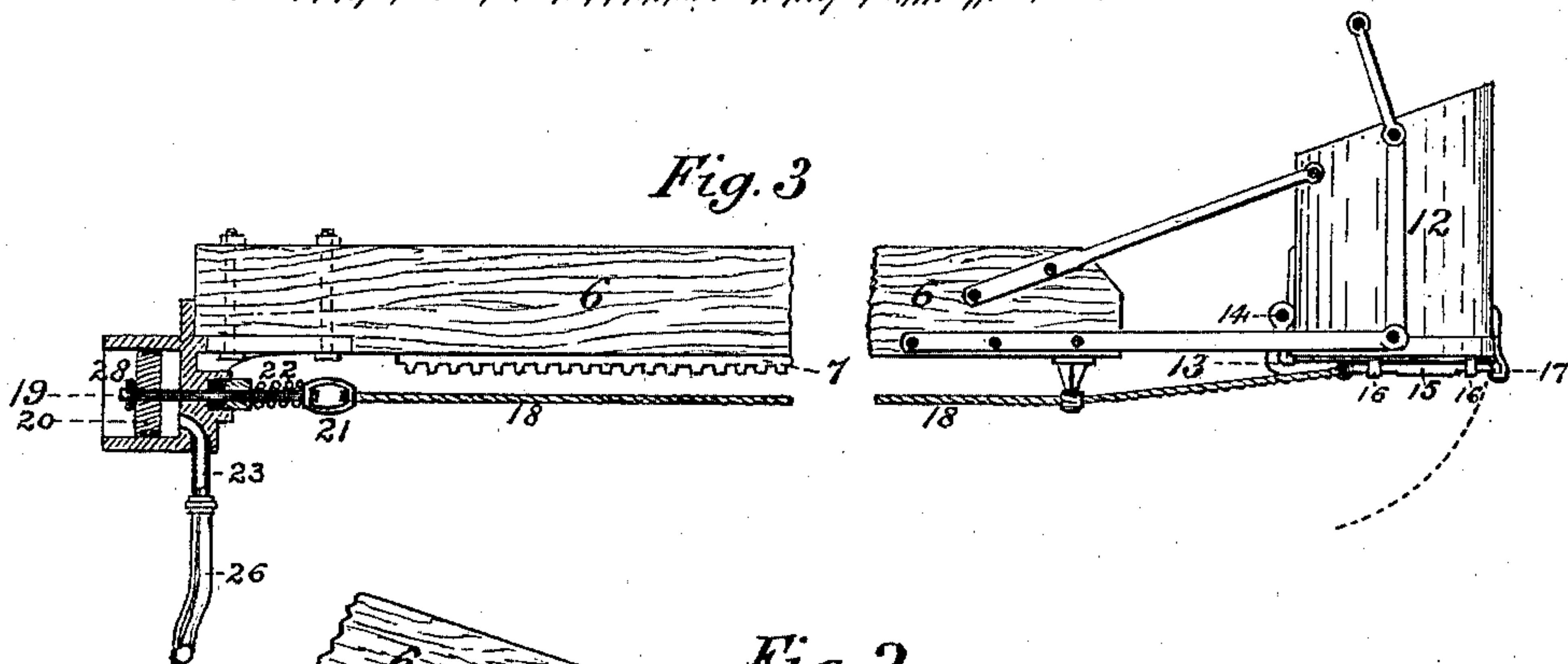
No. 476,808.

Patented June 14, 1892.

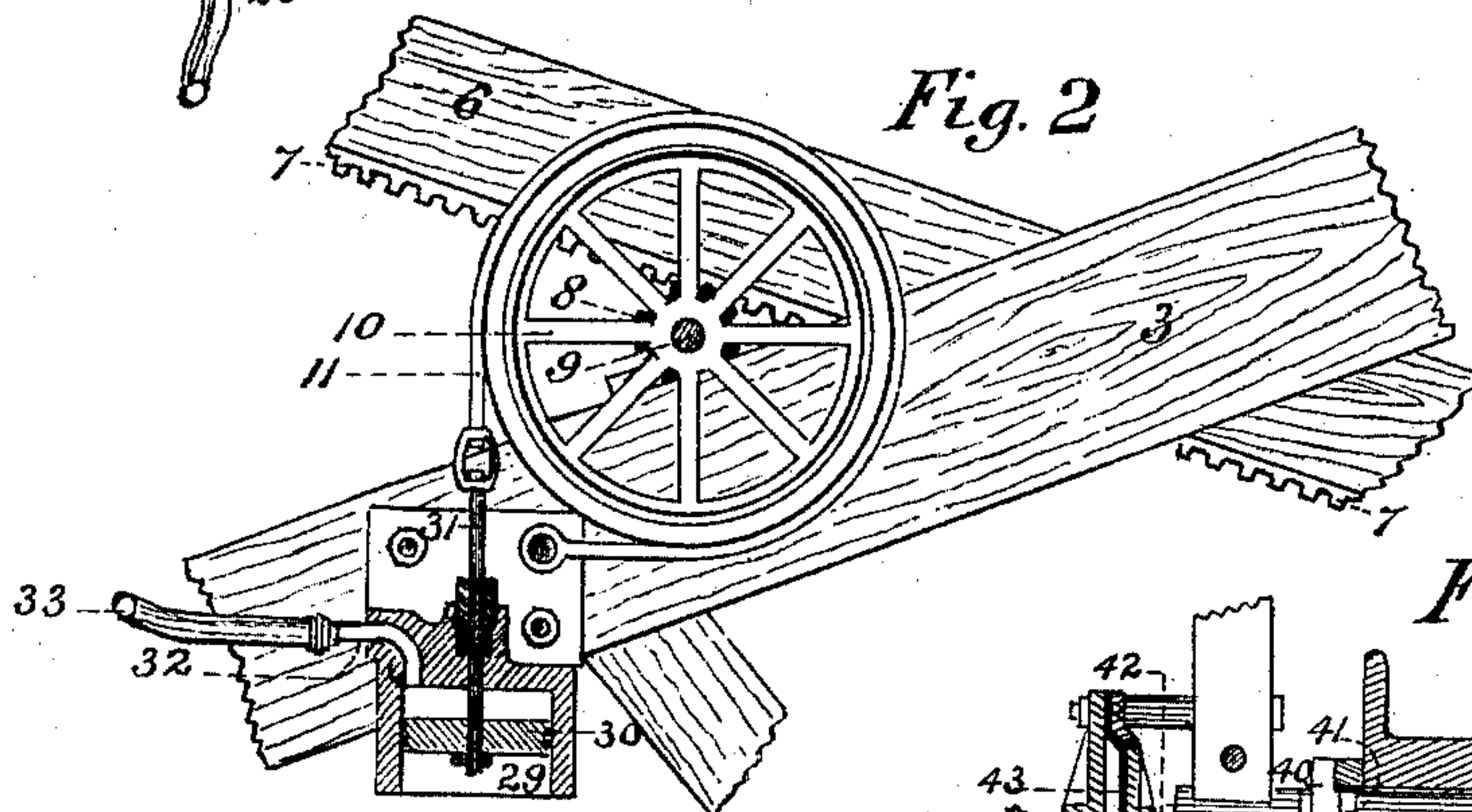
*Fig. 1*



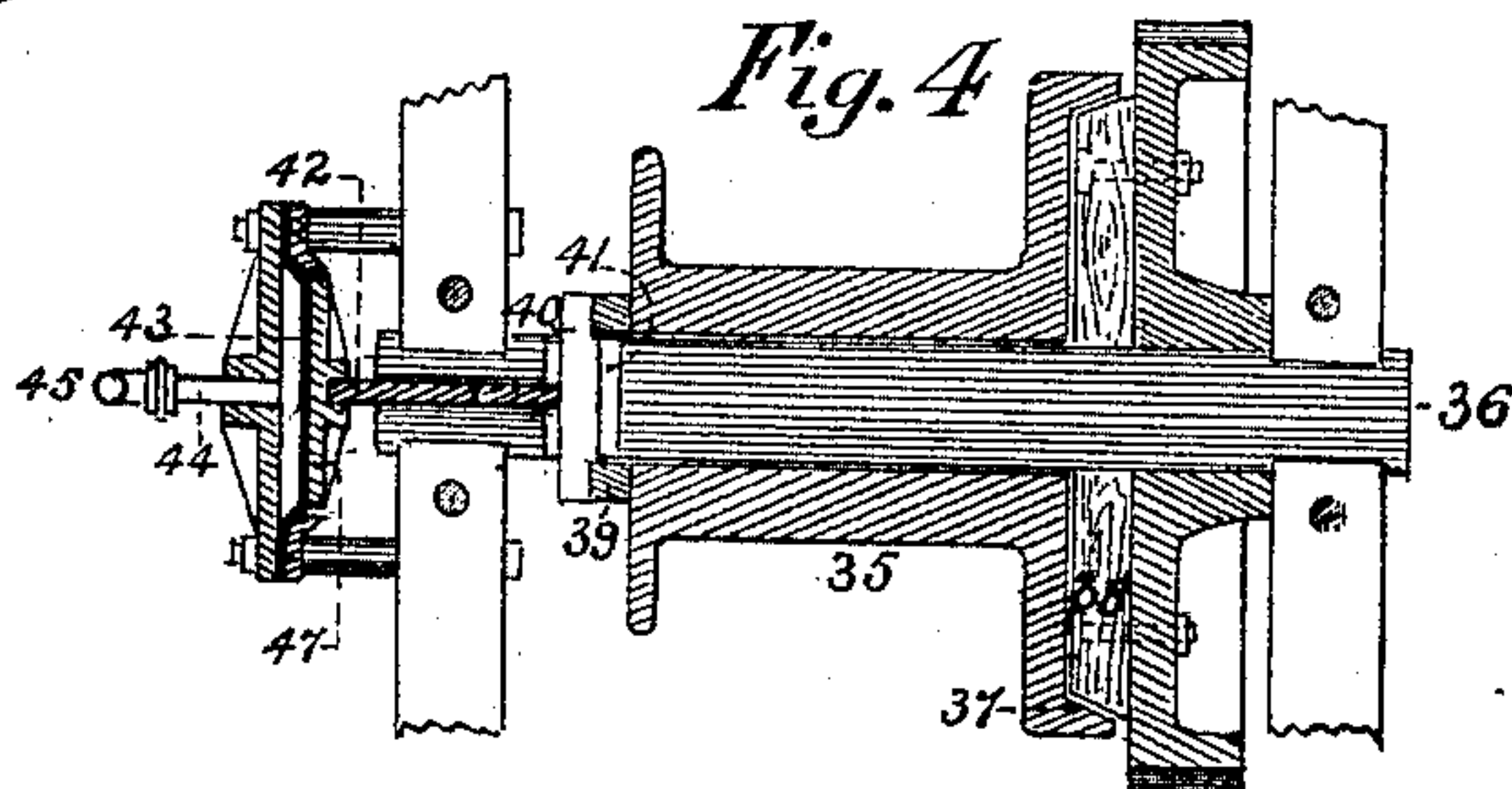
*Fig. 3*



*Fig. 2*



*Fig. 4*



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# UNITED STATES PATENT OFFICE.

JOHN NICHOL, OF CHICAGO, ILLINOIS.

## STEAM-SHOVEL.

SPECIFICATION forming part of Letters Patent No. 476,808, dated June 14, 1892.

Application filed December 22, 1891. Serial No. 415,927. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN NICHOL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have  
5 invented certain new and useful Improvements in Steam-Shovels, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, one side being  
10 removed. Fig. 2 is an enlarged detail, being a side elevation of the brake-wheel and the adjacent portions of the crane and dipper-handle. Fig. 3 is an enlarged detail, being a side elevation of the dipper-handle; and Fig.  
15 4 is an enlarged detail, being a horizontal section of the hoisting-drum.

My invention relates to steam-shovels and to improved devices for operating the dipper. In steam shovels and dredges of the dipper  
20 variety a brake is generally provided for locking the dipper-handle at any desired point, so that when the dipper is being filled it can be held rigidly in proper position. After the dipper has been filled it has been emptied by  
25 unlatching the bottom, so as to permit the contents of the dipper to fall out. The work of applying the brake to the dipper-handle and unlatching or "tripping" the dipper-bottom has been performed by an operator who  
30 worked in company with the engineer of the shovel, and the nature of his work was such that it could not be performed by the engineer in connection with his other duties. The operation of hoisting the dipper after filling it  
35 is usually accomplished by means of a friction-drum and chain, and the duty of operating the hoisting-drum is intrusted to the engineer. Similar remarks apply to ordinary dredges.

40 The principal object of my invention is to provide improved devices for operating the various parts of a steam shovel or dredge, by means of which their operation will be rendered much simpler.

45 Another object of my invention is to so construct and arrange the operating devices that all the different operations of the shovel may be conducted by the engineer and the services of the additional man dispensed with and  
50 a corresponding saving of expense thereby made. I accomplish these objects as herein-

after specified, and as illustrated in the drawings.

That which I regard as new will be pointed out in the claims. 55

In the drawings, 1 indicates the carriage and frame of the steam-shovel.

2 indicates the boiler, which is carried in the carriage.

3 indicates a crane located at one end of the  
60 carriage in the usual manner.

4 indicates a steam-engine for operating the different machinery.

5 indicates a lever connected to the throttle-valve of the engine, which lever is located  
65 at any convenient point, preferably at the forward part of the carriage next to the crane 3.

6 indicates the dipper-handle, which is of the usual construction and is provided on its under side with a rack 7. 70

8 indicates a pinion mounted upon a shaft 9, suitably journaled upon the crane 3 in such position that the pinion 8 will engage the cogs of the rack 7.

10 indicates a brake-wheel mounted upon  
75 the shaft 9.

11 indicates a brake-band encircling the wheel 10, as best shown in Fig. 2.

12 indicates a dipper carried on the end of the handle 6, as best shown in Fig. 3. The  
80 dipper is provided with a hinged bottom 13, which is provided with a hinge 14, as best shown in Fig. 3. The hinge 14 is so arranged as to adapt the bottom 13 to swing outward from the dipper 12 in the direction indicated  
85 by the dotted lines in Fig. 3.

15 indicates a latch-pin sliding in bearings 16, adapted to engage a latch 17, secured upon the bottom of the dipper 12.

The construction of the various parts above  
90 described is substantially similar to that of the ordinary steam-shovels, and I do not wish to limit myself to any particular construction of any of the parts above mentioned.

18 indicates a cable, preferably of wire, one  
95 end of which is connected to the pin 15 and the other end is connected to a piston-rod 19 of a piston 20, working in a cylinder 28, as best shown in Fig. 3. The piston 20 is mounted upon the under side of the upper end of  
100 the dipper-handle, as shown in Fig. 3.

21 indicates a turnbuckle, which serves to



connect the piston and the adjacent end of the cable 18.

22 indicates a spring coiled around the outer end of the piston-rod 19, the ends of which spring abut against the stuffing-box of the piston and the adjacent portion of the turn-buckle 21.

23 indicates a pipe, which opens into the forward portion of the cylinder 28, as best shown in Fig. 3.

24 indicates a reservoir or receiver for compressed air, which is located in any suitable position on the carriage 1. The receiver 24 is supplied with compressed air from an air-pump 25, operated by the engine 4 or by any other suitable device.

26 indicates a hose or other suitable pipe, which conveys air from the receiver 24 to the pipe 23, as shown in Figs. 1 and 3.

27 indicates a valve for controlling the supply of air to the cylinder 28. The valve 27 is a three-way valve, being so arranged that after the air-pressure has been turned into the cylinder 28 by operating the valve the supply of air in the chamber 28 may be exhausted through the hose-pipe 26 and valve 27 to the open air. The valve 27 is so located as to be in convenient reach of the engineer. By operating the valve so as to admit compressed air to the cylinder 28 the piston 20 will be forced back and the pin 15 will be drawn back, unlatching the bottom of the dipper and allowing it to fall away from the dipper when it is raised. The spring 22 will thereby be compressed, and as soon as the pressure of the compressed air is released the spring 22 will act to loosen the cable 18 and allow the pin 15 to move into position to engage the latch 17 on the bottom 13 when the dipper swings downward.

29 indicates a cylinder suitably mounted upon the crane 3 near the brake-wheel 10, as best shown in Fig. 2, in which cylinder work a piston 30 and rod 31, the outer end of which is connected to the free end of the brake-band 11, as shown in Fig. 2.

32 indicates a pipe for conducting air into the upper portion of the cylinder 29.

33 indicates a hose or other suitable pipe for conducting air from the reservoir 24 to the pipe 32.

34 indicates a three-way valve suitably mounted in the pipe 33, so as to be conveniently operated by the engineer. By admitting a supply of fresh air to the cylinder 29 the piston 30 and rod 31 will be drawn downward, tightening the band 11 upon the brake-wheel, and thereby locking the brake-wheel against rotation. When loading the dipper, as the earth is scraped up by it there is a strong upward pressure upon the dipper-handle 6, and it is therefore necessary to lock the handle against upward movement to permit of the dipper being filled. When the dipper is raised or lowered, the rack 7 will move upon the pinion 8 and will cause it to rotate, thereby rotating the brake-wheel 10. When it is

desired to lock the dipper-handle at any desired position, the brake-band 11 may be readily tightened, as above described, and the brake applied by the engineer.

35 indicates the hoisting-drum, which is of a form commonly used in machines of this class. The drum 35 is mounted upon a shaft 36, suitably mounted upon the carriage, and is provided at one end with a bearing-surface 37, preferably conical, which is adapted to frictionally engage a plate 38, which is preferably in the form of the frustum of a cone, which plate is mounted upon and rotates with the shaft 36. The shaft 36 is rotated from the engine 4, and when not in use the drum 35 remains loosely mounted upon the shaft. When in use, the drum 35 is forced into frictional engagement with the plate or frustum 38, and is thereby caused to rotate. To cause such frictional engagement between the drum 35 and frustum 38, the following apparatus is provided:

39 indicates a ring mounted upon the shaft 36 at the end of the drum 35, as best shown in Fig. 4.

40 indicates a bar mounted in a slot 41 near the end of the shaft 36. The bar 40 is adapted to be moved longitudinally of the shaft to engage the ring 39 and through it to force the drum 35 against the frustum 38. The ring 39 acts as an anti-friction bearing.

42 indicates a pin mounted centrally in the end of the shaft 36 and adapted to move longitudinally of said shaft and to bear against the bar 40.

43 indicates an expansion-diaphragm, which is fastened on the frame of the hoisting-engine in line with the shaft 36.

44 indicates a pipe for conducting compressed air into the diaphragm.

45 indicates a hose or other suitable pipe for conveying air to the pipe 44 from the reservoir 24.

46 indicates a three-way valve mounted in the pipe 45, where it may be conveniently operated by the engineer.

47 indicates a plate mounted in the frame of the hoisting-engine between the diaphragm and the adjacent end of the shaft 36, to the center of which plate is attached the pin 42, as best shown in Fig. 4.

By admitting a supply of compressed air to the diaphragm 43 it will be expanded, and the bar 40 will be forced against the ring 39, thereby causing the drum 35 to move into frictional engagement with the frustum 38, thereby causing the drum to rotate. As soon as the air-pressure is removed the pressure upon the drum will be removed and its rotation will cease.

By providing the mechanism above described for operating the different parts of the machine their operation is rendered much more simple, and they may all be readily operated by a single operator. As it is necessary in machines of this class that the time of the operation of the various portions of the



machinery should be accurately regulated by arranging the various parts so that they may be operated by the same person, the timing may be made much more accurate and better results thereby secured.

I have shown cylinders as being used to operate the brake and to unlatch the dipper bottom; but instead of such cylinders diaphragms similar to that which operates the hoisting-drum may be used, and a cylinder may be used to operate the hoisting-drum, if desired, instead of the diaphragm.

That which I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a crane, a dipper having a hinged bottom, a latch for latching said bottom, and a dipper-handle, of a rope connected to said latch, and devices operated by compressed air for pulling said rope to unlatch said bottom, substantially as described.

2. The combination, with a crane, a dipper having a hinged bottom, a latch for latching said bottom, and a dipper-handle, of a cylinder mounted upon said dipper-handle, a piston working in said cylinder, a piston-rod, means for connecting the piston-rod and the latch, and a pipe for conducting compressed air into said cylinder, substantially as and for the purpose specified.

3. The combination, with an air-compressor, a crane, a dipper having a hinged bottom 13, a latch-bolt 15, latch 17, and rope 18, of a cylinder 28, piston 20, rod 19, connected to said rope, spring 22, and a pipe for conducting compressed air into the cylinder 28, substantially as and for the purpose specified.

4. The combination, with a crane, a dipper-handle mounted upon said crane, mechanism for moving said dipper-handle upon said crane, and a dipper carried by said handle, of a brake for said dipper-handle, and devices

operated by compressed air for setting said brake, substantially as described.

5. The combination, with a crane, a dipper-handle mounted upon said crane, mechanism for moving said dipper-handle upon said crane, and a dipper carried by said handle, of a brake-wheel 10, brake-band encircling said brake-wheel, and devices operated by compressed air for tightening said band upon said brake-wheel to set the brake, substantially as described.

6. The combination, with an air-compressor, a crane, a dipper-handle mounted upon said crane and having a rack 7, a dipper carried by said handle, shaft 9, pinion 8, brake-wheel 10, and brake-band 11, of a cylinder 29, a piston 30, rod 31, connected to said brake-band, and a pipe for conducting compressed air into said cylinder, substantially as and for the purpose specified.

7. In a steam-shovel, the combination, with a crane, a dipper-handle, a dipper having a hinged bottom, devices operated by compressed air to unlatch said bottom, a brake operated by compressed air to lock the dipper-handle in a stationary position, a hoisting-drum, and mechanism operated by compressed air to effect the rotation of said drum, of compressed-air pipes 26, 33, and 45 and valves 27, 34, and 46 for controlling the admission of compressed air to said pipes, a steam-engine 4, and lever 5 for controlling the supply of steam to said engine, the lever 5 and valves 27, 34, and 46 being arranged in proximity to each other, substantially as and for the purpose specified.

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Witnesses:

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