No. 611,084. Patented Sept. 20, 1898.

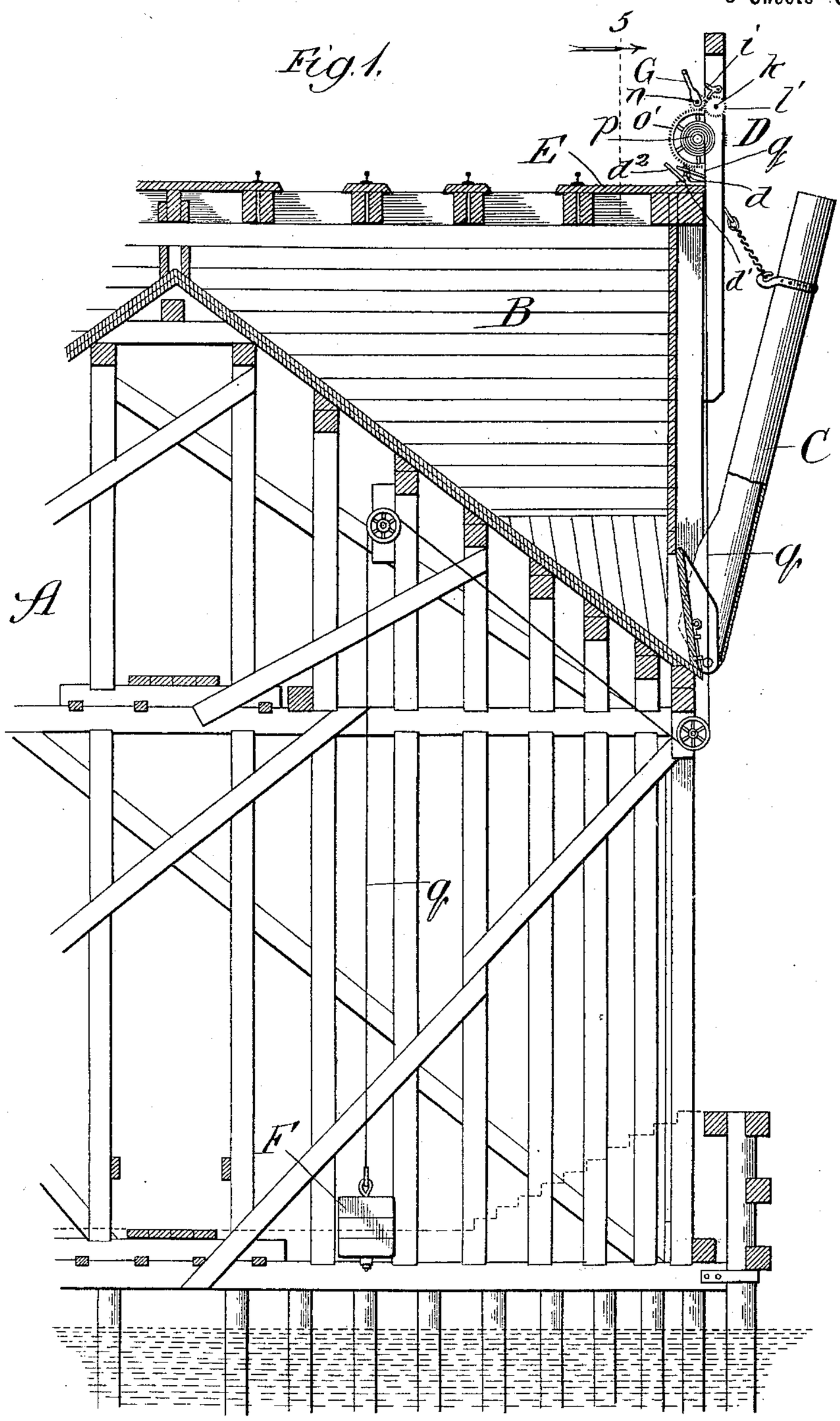
A. A. STROM.

HOISTING APPARATUS.

(Application filed Apr. 18, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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Luther S. Miller.

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Fig. 2.

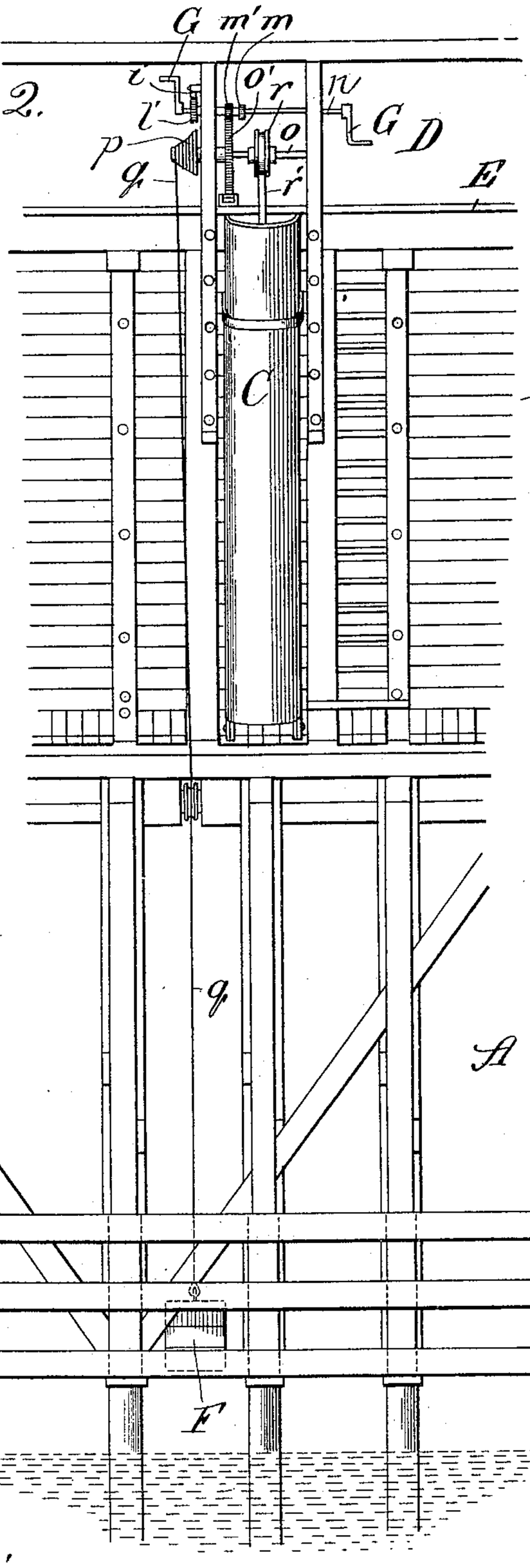

Fig. 3.

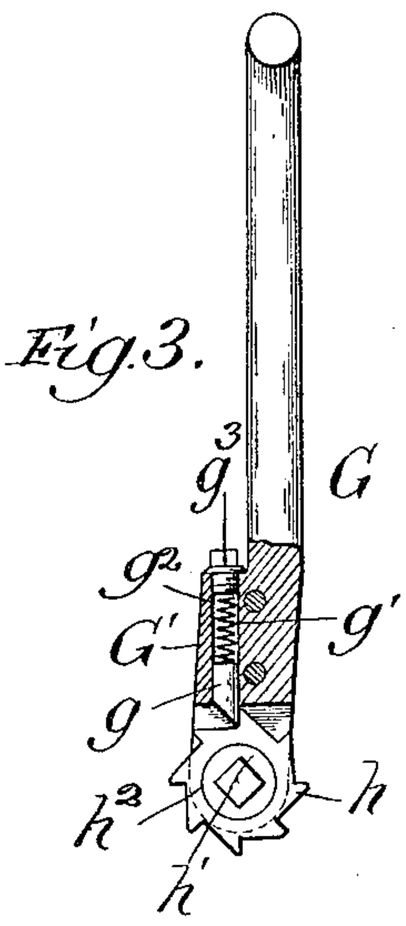

Fig. 4.

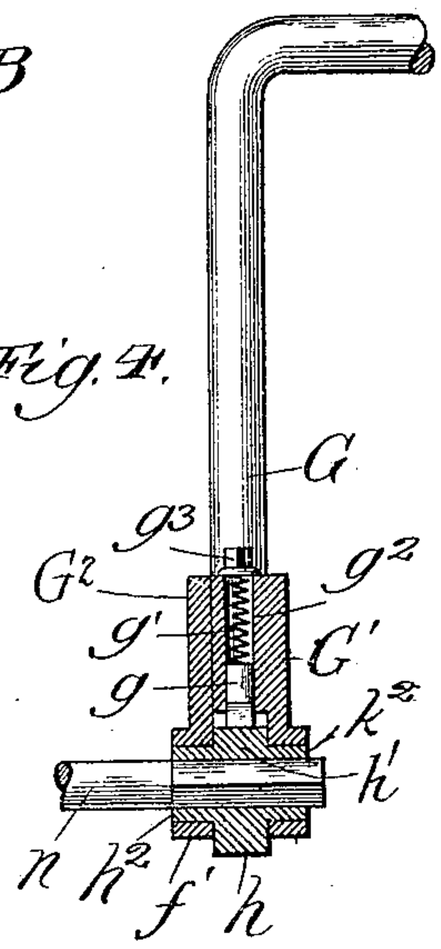

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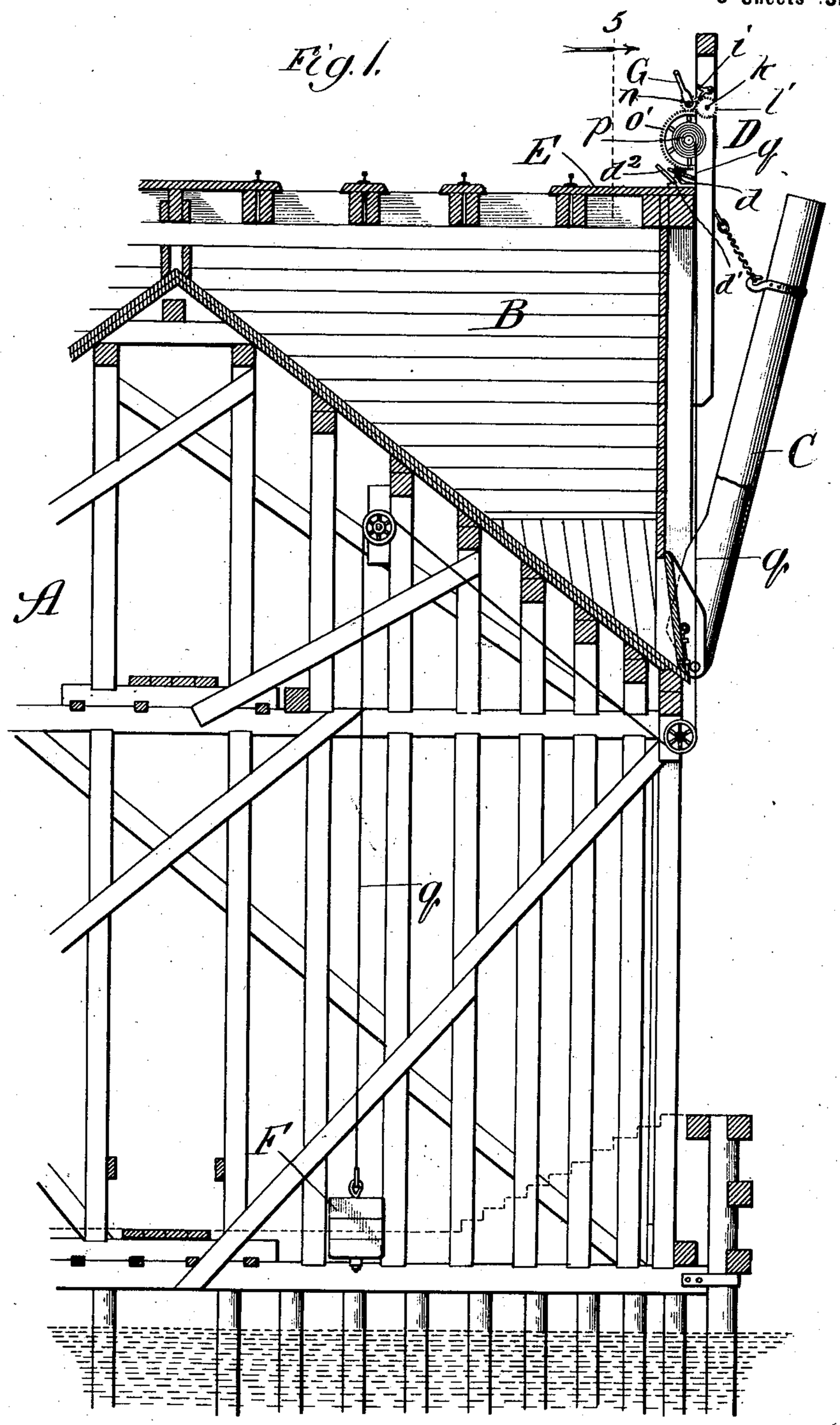
Fig. 1.



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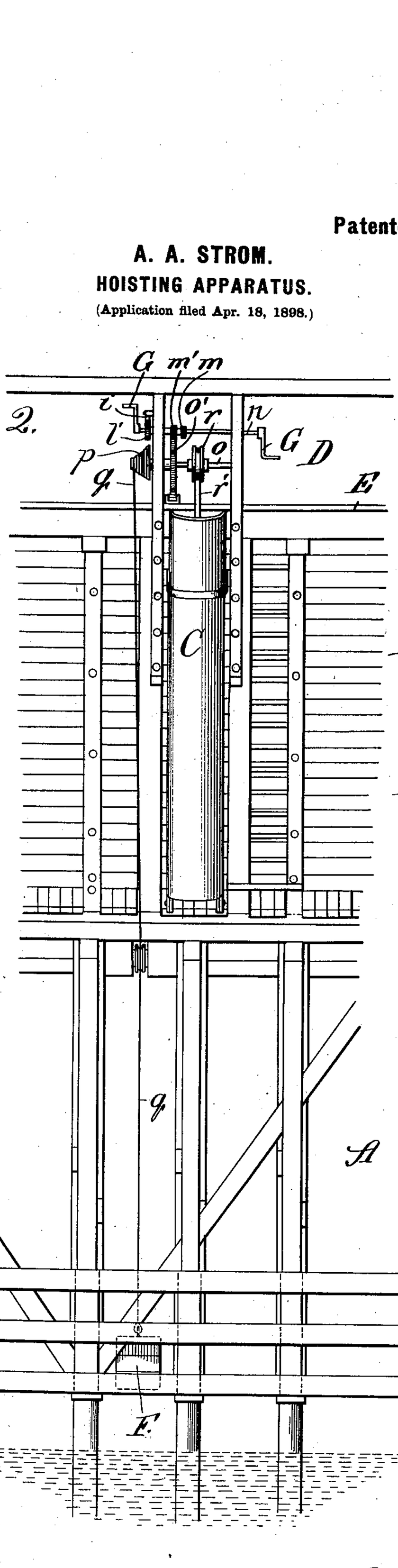

Fig. 3.

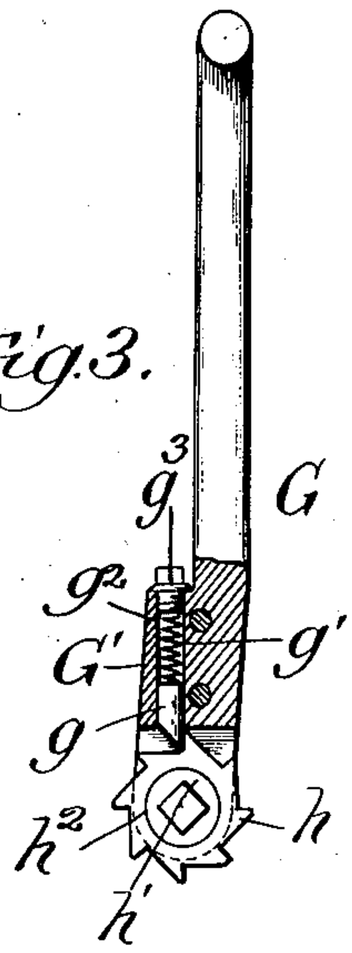

Fig. 4.

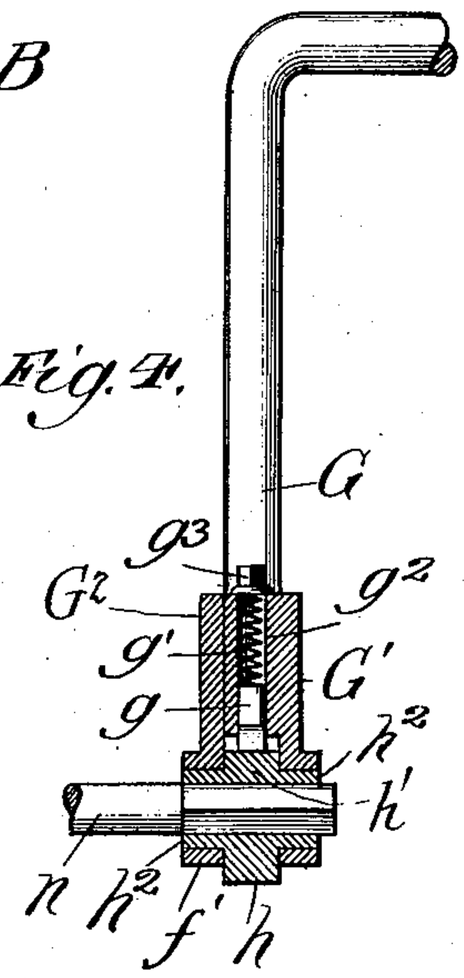

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Fig. 6.

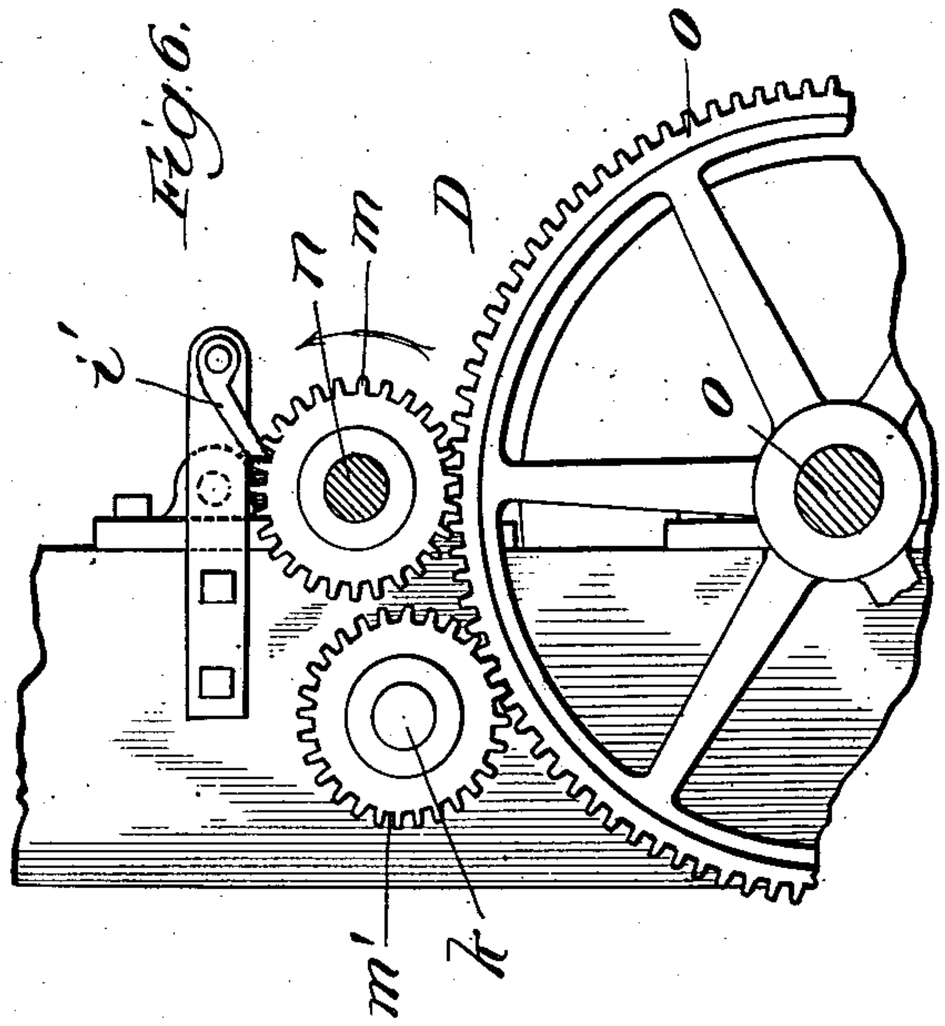


Fig. 7.

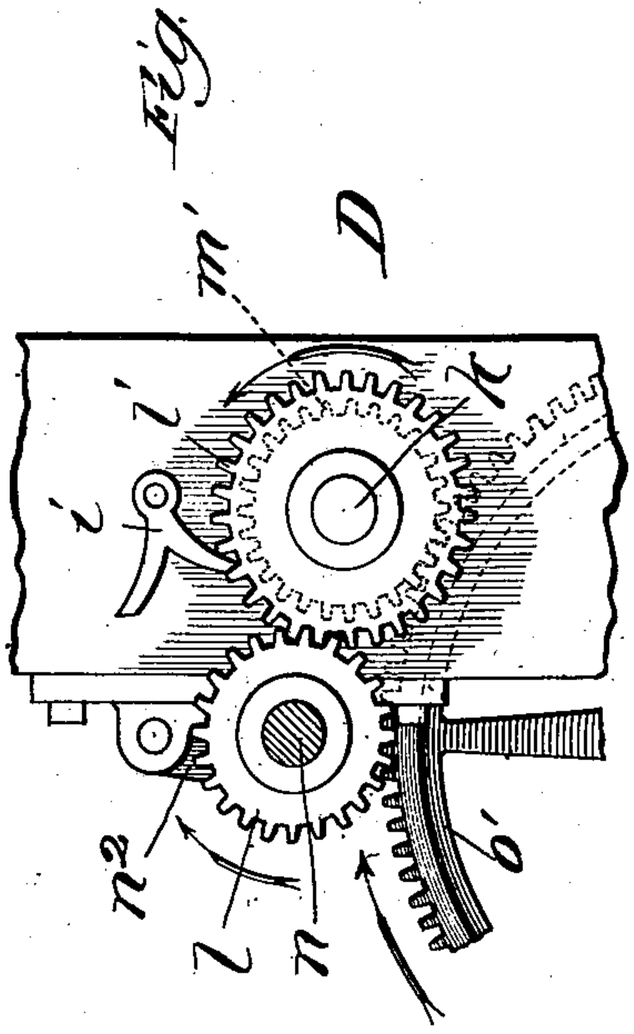


Fig. 5.

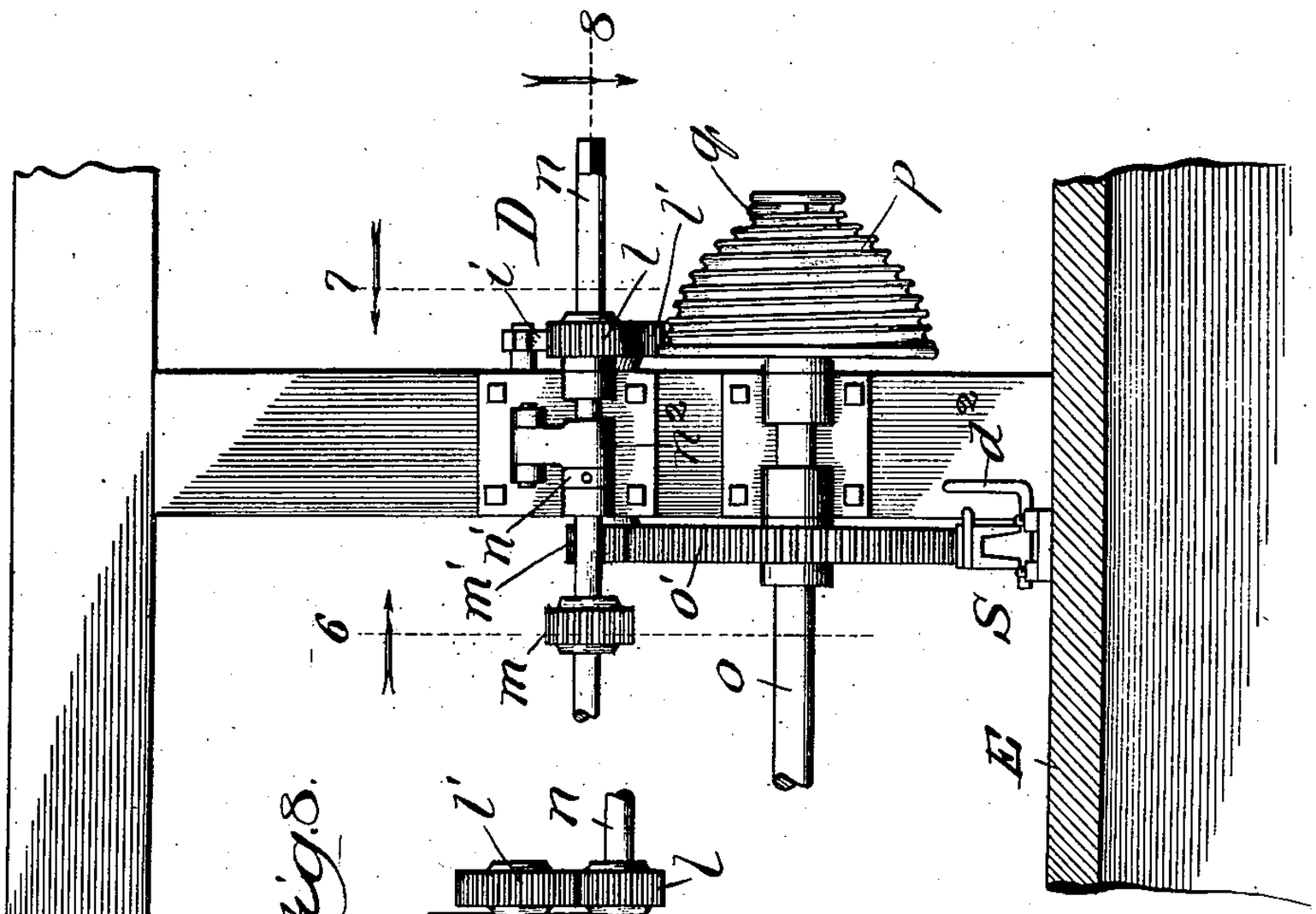
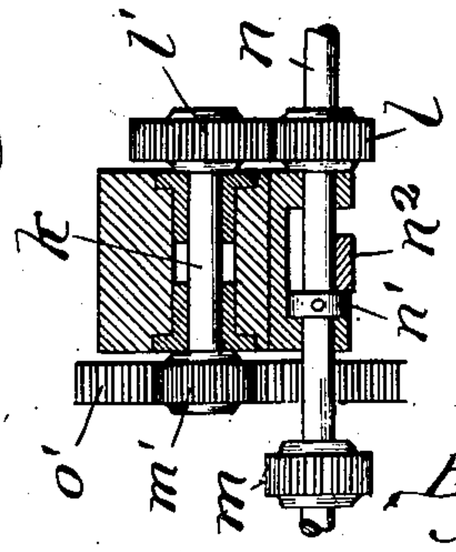


Fig. 8.



Witnesses:
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Fitz S. Stites.

Inventor:
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UNITED STATES PATENT OFFICE.

AXEL A. STROM, OF AUSTIN, ILLINOIS, ASSIGNOR TO THE STROM MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS.

HOISTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 611,084, dated September 20, 1898.

Application filed April 18, 1898. Serial No. 678,005. (No model.)

To all whom it may concern:

Be it known that I, AXEL A. STROM, a citizen of the United States, residing at Austin, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Hoisting Apparatus, of which the following is a specification.

My invention relates to an improvement which I have particularly devised for use with the hoisting apparatus employed in connection with the counterbalanced discharge-spout of coal and ore docks.

In working the hoist in the particular connection referred to, which is commonly done by hand labor, the workmen are under the great disadvantage of having to turn the crank-shaft backward to move the spout in one of the two directions. The hoisting apparatus occupies a position at a high elevation, and the platform-room adjacent to it for the workmen is inadequate to permit of changing their position with reference to the crank-shaft, so that while they can have proper purchase in turning the shaft forward they lack purchase in turning it in the contrary direction.

One of the objects of my invention is to overcome the difficulty referred to by providing means for enabling the counterbalanced pivotal spout to be alternately raised and lowered while lowering and raising the counterbalance-weight without requiring change in the direction of turning the crank-shaft. The position of the workmen is rendered dangerous, owing to the possibility of the cable breaking that connects the spout with its winding-drum or that carries the counterbalancing-weight. In that event the workmen are liable to be struck and killed or injured and thrown off their platform into the water by the consequent loss of control of the crank-handles, which will be turned backward with tremendous force and speed under the power of the falling counterbalance-weight or spout, whichever remains in connection with the crank-shaft after the severance of the supporting-cable of the other.

My further object is to provide means whereby the crank-shaft handle shall be independent of the crank-shaft in case the weight-cable should break while the spout is lowering or the spout-cable should break while the weight is descending, and also to provide means for dogging the hoist to arrest the spout if while it is rising the weight-cable should break and to arrest the weight if while it is rising the spout-cable should break.

Referring to the accompanying drawings, Figure 1 is a view in sectional elevation of an ore or a coal dock provided with a hoisting apparatus equipped with my improvements; Fig. 2, a view showing the same in front elevation; Fig. 3, an enlarged broken view in elevation, partly sectional, of my improved crank-shaft handle; Fig. 4, a similar view of the same, taken at a right angle to the view presented by Fig. 3; Fig. 5, a broken view, enlarged over the scale in Figs. 1 and 2, showing my improved hoisting apparatus in elevation; Fig. 6, a broken section taken at the line 6 on Fig. 5, viewed in the direction of the arrow and enlarged and showing the preferred construction and arrangement of the dog; Fig. 7, a similar view taken at the line 7 on Fig. 5 and viewed in the direction of the arrow, and Fig. 8 a section taken at the line 8 on Fig. 5 and viewed in the direction of the arrow.

A denotes the dock, and B is a bin or pocket surmounting it.

C is the pivotal spout or chute.

D is the hoisting apparatus, involving the main shaft *o*, journaled in the usual manner above the bin at the front side of the dock and carrying a drum or pulley *r*, connected by a cable *r'* or other flexible medium with the spout, a pulley *p*, from which the counterbalancing-weight F is suspended by a cable *q*, and a driving gear-wheel *o'*.

The parts thus far described need involve no features of novelty, but may be of any suitable or well-known construction, so that they do not require more detailed description in this connection.

One of my improvements involves a reversing driving-gear for the main shaft, adapted to turn the main shaft in either direction by turning the driving-gear shaft in one direction. Following is a description of my said improvement as I prefer to construct it: Adjacent to the shaft *o* above the platform E is journaled the counter-shaft *n*. The shaft *n* is longitudinally adjustable in its bearings

and carries between them a collar n' to be engaged at one side or the other by a stop n^2, hinged in suitably-adjacent position. The shaft n carries at opposite sides of its bearings the same-sized pinions m and l. In a bearing immediately behind that of the shaft n is journaled a shaft k, carrying at its opposite ends, respectively, the pinion m' of the same size as the pinion m and permanently meshing with the gear-wheel o' and the larger pinion l'. With the shaft n in the position in which it is shown in Fig. 5, with the stop n^2 holding it against longitudinal movement therefrom, by turning the shaft through the medium of a crank-handle G, applied to one or to each squared end, in the direction indicated by the arrow on Fig. 7 the spout C is raised and the weight F is lowered, since the pinion l meshes with the pinion l' to turn the shaft k and the pinion m' to drive the gear-wheel o' and shaft o, and thus wind the cable r' on the drum r and unwind the cable q from the pulley p. When it is desired to lower the spout and raise the counterbalancing-weight, the operator lifts the stop-latch n^2 on its hinge and shifts the shaft n by moving it lengthwise till the pinion m meshes with the gear-wheel o', thereby moving the pinion l beyond and out of engagement with the pinion l' and leaving the pinion m' as an idler in mesh with the gear-wheel. Thus shifting the shaft n brings the collar n' to the opposite side of the plane of the stop-latch n^2 from that at which it is shown in Figs. 5 and 8, whereby when the stop-latch is lowered it bears against the opposite side of the collar to confine the shaft against longitudinal displacement. By then continuing the rotation of the shaft n in the same direction as before the engagement of the pinion m with the gear-wheel o' turns the shaft o in the contrary direction to unwind the cable r' for lowering the spout and wind the cable q for raising the weight.

In the event that during the operation of raising the spout C the cable q should break it is desirable to prevent the spout C from falling, aside from the injury liable to ensue as a consequence to the workmen, for if the spout falls it is liable to become bent and disorganized itself and to damage the dock structure. To prevent this, I may provide a double dog i to engage the pinion l' in the direction shown while the spout is being raised, with the parts of the hoisting mechanism in the relative positions they occupy according to the representation in Fig. 5. Then while the shaft n is being turned for raising the spout should the weight-supporting cable break the weight of the unbalanced spout would tend to reverse the motion of the shaft n; but it would be checked by the brake action of the dog i against the pinion l'. If the double dog i is used, it must be reversed when the shaft n is shifted to cause its rotation in the same direction to lower the spout and raise the weight F, the reversal of the dog engaging it with the pinion l' in the direction opposite that in which it is shown in Fig. 7 to engage therewith. Then should the cable r' break while the spout is falling and the weight is rising the tendency of the gravity of the weight to turn the shaft n backward will be checked by the action of the dog i against the pinion l', thereby preventing rotation of the shaft k, and the consequent stoppage of the pinion m' will cause it to brake the gear-wheel o', with which it is in mesh. The same object—namely, of arresting the rising spout if the weight-cable breaks and of arresting the rising weight if the spout-cable breaks—may best be accomplished by the use of a single dog i', applied to the shaft n, preferably through the medium of the pinion m, as shown in Fig. 6, since as that pinion is on the shaft n the latter can never be reversed by the unwinding of either cable r' or q under the load it carries; but then the width of the dog i' must be sufficient to maintain it in engagement with its pinion m in each position thereof under the shifting adjustment of the shaft n.

Each crank for the shaft n involves the following-described construction: On the squared end of the shaft n is a sleeve h', conforming internally to the cross-section of its bearing on the shaft. Between its ends the sleeve carries a ratchet h, and at opposite sides of the ratchet the sleeve has externally-cylindrical end portions h^2 h^2. The lower end portion of the crank-handle G is expanded into a head G', having formed in it a vertical chamber g', in which is contained a dog g to engage the ratchet h under the yielding pressure of a spring g^2, confined in the chamber by a screw-plug g^3. The head G' terminates in a cylindrical bearing f to surround the outer end h^2 of the sleeve h', and a face-plate G^2, having a bearing f' to surround the inner end h^2 of the sleeve, is fastened to the head G'. By this construction turning the crank-handles G in one direction (forward) turns the shaft n by engagement of the dogs g with the ratchets h either to raise the spout and lower the counterbalance or to lower the spout and raise the counterbalance, depending on whether the shaft n occupies the position in which it is shown or that to which it is shifted, in the manner described.

Should the weight-cable q break while the spout is being lowered, nothing will stop it, and it will spin the shaft n about with great rapidity, but without turning the handles G, since the ratchets h will slip past the dogs g, and the handles will remain stationary in the hands of the workmen. The same result will obviously ensue should the spout-cable break while the weight is falling.

With the particular mechanism shown it is necessary to hold the gear-wheel o' while changing the reversing-gear. For this purpose I provide a stop device S, shown as a pivotal rack d, supported to be engaged with the teeth of the gear-wheel o' by means of a cam d', operated by a handle d^2.

While I have embodied in one hoisting apparatus the several improvements herein described—namely, the shifting shaft-gearing, the shaft *n* rotatable independently of its operating-crank in the direction of its turning under the strain of the spout or weight in falling when either is relieved of the counterbalancing effect of the other, and the dog device for arresting the spout or weight against falling while being raised—in the event of the cable of the one or the other then breaking it is within my invention to employ one or more of these devices in a single hoisting apparatus. Moreover, I do not limit my invention to the details of construction shown and described as being involved in my several improvements, as they may be variously modified by those skilled in the art without departure from the spirit of the invention. For example, as one change that occurs to me, the shaft *n* need not itself be adapted to be shifted, but the pinions it carries may be shifted on the shaft, or they might be loosely supported thereon to be clutched when required. It is my intention to include these changes as within my invention as equivalents for the shifting crank-shaft, particularly as expressed by the terms of the appended claims, except the third.

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

1. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, and a reversing driving-gear comprising a counter-shaft longitudinally adjustable in its bearing and carrying pinions, and a rotary shaft carrying a pinion permanently meshing with said driving gear-wheel and a pinion to mesh with one of the pinions on said counter-shaft when the other pinion thereon is out of mesh with said driving gear-wheel, substantially as and for the purpose set forth.

2. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, and a reversing driving-gear comprising a counter-shaft *n* longitudinally adjustable in its bearing and carrying the pinions *m* and *l*, a shaft *k* carrying the pinions *m'* and *l'*, a collar *n'* on said counter-shaft and a stop n^2 adjustable to engage said collar in either position of said counter-shaft, the whole being constructed and arranged to operate substantially as described.

3. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, a reversing driving-gear adjustably engaging said gear-wheel to turn the main shaft in either direction by turning said reversing-gear in one and the same direction, a counter-shaft in said reversing-gear, and an operating-handle engaging said counter-shaft to turn it in one direction and leave the counter-shaft free to be turned in the same direction independently of said operating-handle, substantially as and for the purpose set forth.

4. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, a reversing driving-gear adjustably engaging said gear-wheel to turn the main shaft in either direction by turning said reversing-gear in one and the same direction, a counter-shaft in said reversing-gear carrying a ratchet, an operating-handle loosely mounted on said counter-shaft and a dog on said handle to engage said ratchet by turning the handle in one direction and leaving the counter-shaft free to be turned in the same direction independently of said handle, substantially as and for the purpose set forth.

5. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, a reversing driving-gear adjustably engaging said gear-wheel to turn the main shaft in either direction by turning said reversing-gear in one and the same direction, a counter-shaft *n* in said reversing-gear, a ratchet *h* on said counter-shaft and an operating-handle G having a head G' by which it is loosely journaled on said counter-shaft and containing a spring-controlled dog engaging said ratchet, substantially as and for the purpose set forth.

6. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, a reversing driving-gear adjustably engaging said gear-wheel to turn the main shaft in either direction by turning said reversing-gear in one and the same direction, and a dog engaging said driving-gear to prevent reverse turning of said main shaft, substantially as and for the purpose set forth.

7. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, a reversing driving-gear comprising a counter-shaft *n* longitudinally adjustable in its bearing, pinions *m* and *l*, on said counter-shaft, a shaft *k*, pinions *m'* and *l'*, on said shaft, and a dog engaging the pinion *l'*, substantially as and for the purpose set forth.

8. In a hoisting apparatus, the combination with the main shaft of a driving gear-wheel, a reversing driving-gear comprising a counter-shaft *n* longitudinally adjustable in its bearing, pinions *m* and *l*, on said counter-shaft, a shaft *k*, pinions *m'* and *l'*, on said shaft, and a dog *i* reversible to engage the pinion *l'* in either direction, substantially as and for the purpose set forth.

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In presence of—
R. T. SPENCER,
DAN W. LEE.