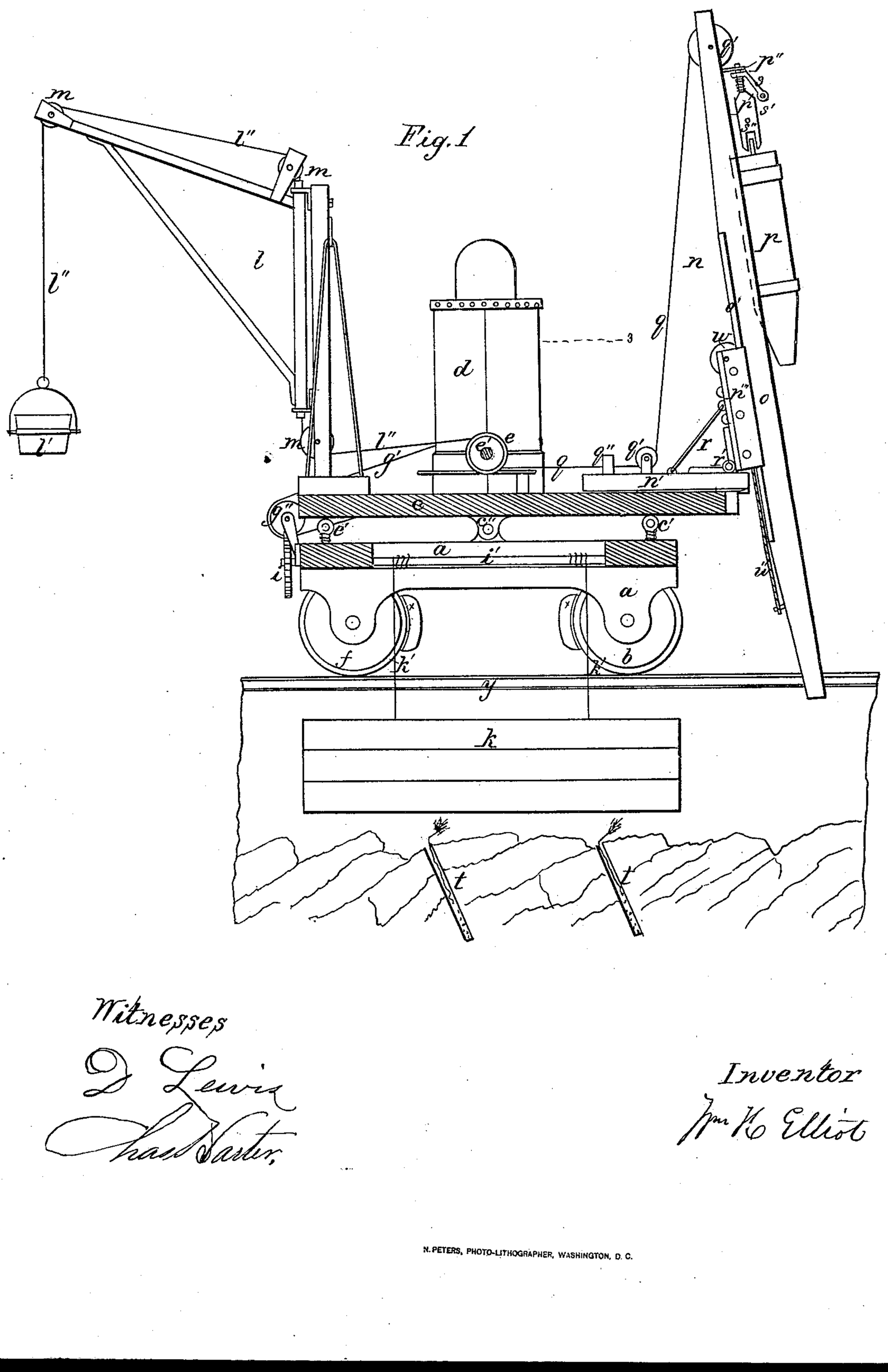
Sheet 1-2 Sheets.

W. H. Elliot

Excavating Machine

No. 97,068. Patented Nov. 23, 1869.

Fig. 1



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Sheet 2-2 Sheets.

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Excavating Machine.

No. 97,068. Patented Nov. 23, 1869.

Fig. 2

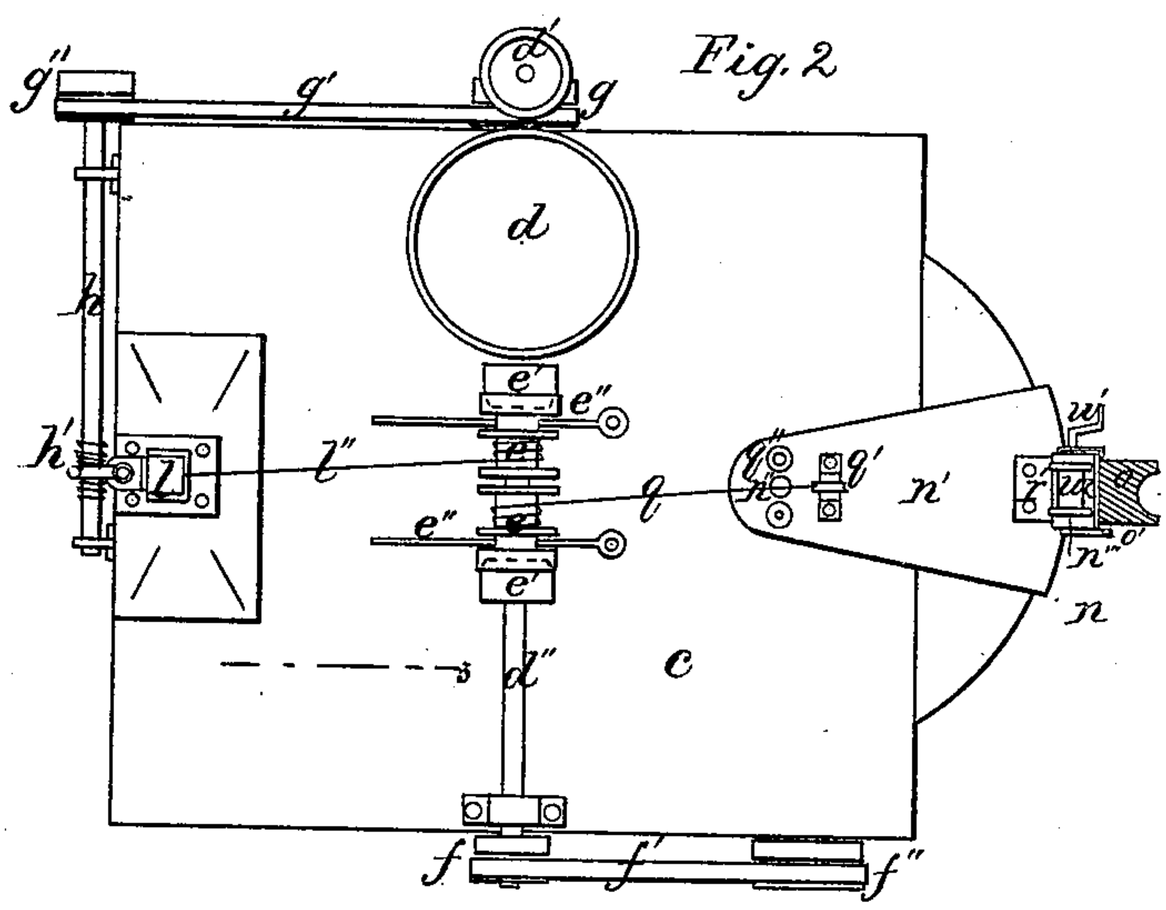


Fig. 3

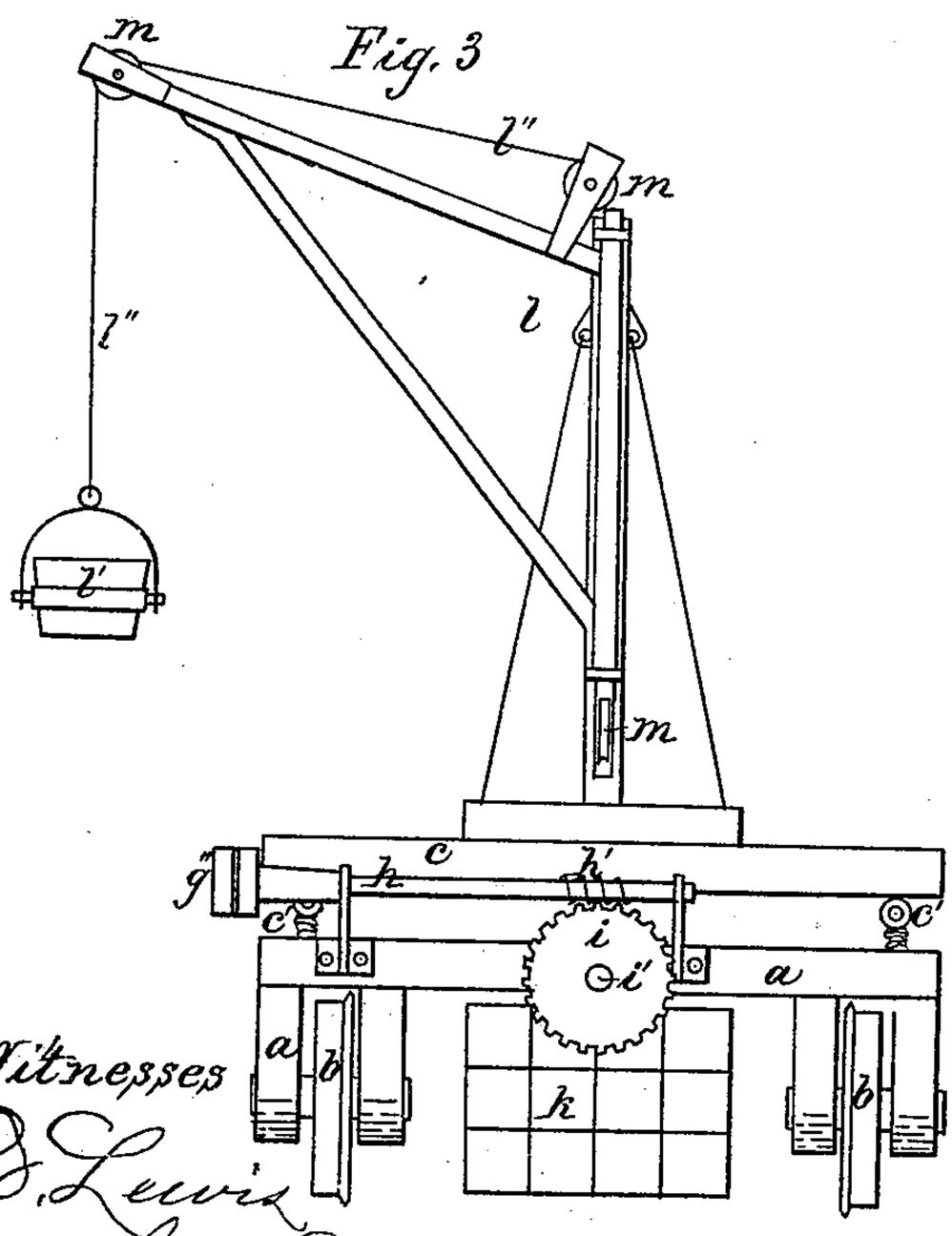
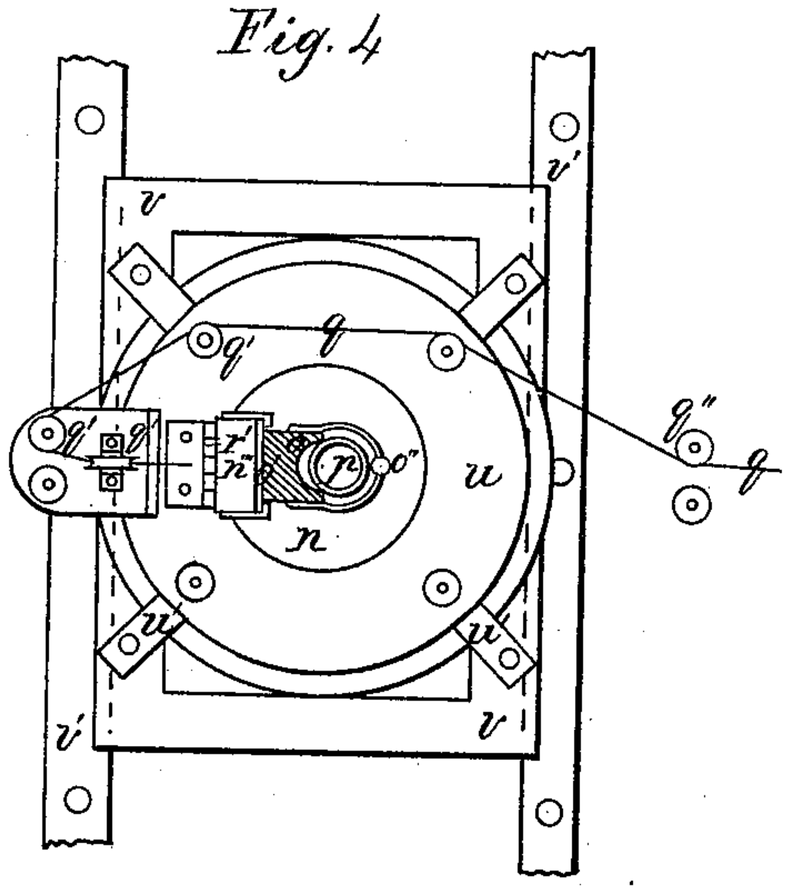


Fig. 4



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WILLIAM H. ELLIOT, OF NEW YORK, N. Y.

Letters Patent No. 97,968, *dated November* 23, 1869.

IMPROVED EXCAVATING-MACHINE.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, WILLIAM H. ELLIOT, of the city, county, and State of New York, have invented new and improved Machinery for Excavating Rock and Ore; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Similar letters of reference indicate the same devices in all the figures.

To enable others skilled in the arts to comprehend, make, and use my invention, I will proceed to describe its nature, construction, and operation.

The nature of my invention consists in combining, with a locomotive-car, a crane for the purpose of raising rock and ore, an apparatus for breaking rock or ore, a shield for covering blasts, and also in hinging the platform of the car in the middle, so as to tilt it, for the purpose of keeping the machinery level on all grades; and

It further consists in the employment of several novel devices for adjusting and operating the crane, shields, platform, and devices for breaking stone.

Figure 1 is an elevation of my machinery for excavating rock, showing the car in section at dotted line *z*, fig. 2. It also shows a sewer in section with a shield suspended in it over two charged holes in the rock below.

Figure 2 is a plan of the car, showing a section of the machinery at dotted line *z*, fig. 1.

Figure 3 is an elevation of the rear end of the car, showing the crane and machinery for raising and lowering the shield.

Figure 4 is a modification of part of my invention, showing a plan of the drop or apparatus for breaking stone on a revolving bed-piece.

These drawings represent my invention in its application to sewers.

a, truck of the car.

b, wheels.

c, platform of the car.

c', adjusting-screws.

c'', hinge between the truck and platform.

d and *d'*, boiler and engine.

d'', crank-shaft.

e, windlasses for winding up the ropes of the crane and drop.

e', friction-cones fastened to the crank-shaft, which carry the windlasses.

e'', levers by which the windlasses are forced against the cones.

f, tight pulley on one end of the crank-shaft.

f'', belt connecting *f* with pulleys *f'''* on one of the axles of the car.

g, pulley on the other end of the crank-shaft.

g', belt connecting the same with tight and loose pulleys *g''* on shaft *h*.

h', worm on shaft *h*, which works in gear *i* on shaft *i'*.

k', suspending-ropes or chains attached to shield *k* and wound on shaft *i'*.

l, crane.

l', iron tub for raising stone.

l'', rope of the crane.

m, pulleys over which the rope passes as it is wound up by windlass *e*.

n, drop.

n', swinging bed-piece of the drop, having its centre of motion in *n''*.

n''', vertical support of guides or ways *o*. These ways move up and down in support *n'''*, being held in place by projections *o''*.

p, drop-hammer for breaking stone.

p', clutch which attaches the hammer to rope *q*.

q' and *q''*, pulleys which guide the rope to the windlass.

r, brace of support *n'''*, which hooks into several staples, so as to give greater or less inclination to ways *o*.

p'', stop which trips the clutch and releases the hammer *p*.

s and *s'*, connecting-rod and lever of clutch *p'*.

t, blasts or charges in the rock in the bottom of the excavation.

u, revolving bed-piece of the drop.

u', V's which support the support the same.

v, frame to which the V's are attached.

v', ways upon which the drop slides across the car.

w and *w'*, windlass and crank for winding up cord *w''* to raise the ways *o*.

x, brakes of the car.

y, track or rail lying upon the ground, upon which the car runs.

z, dotted lines showing points of sections.

The support *n'''* is hinged to the swinging bed-piece at *r'*.

My invention refers to machinery for excavating deep-rock or ore cuts, such as cellars, sewers, vertical mines, and other similar excavations, and is a continuation of the invention shown in my patents of June 18, 1867, for the same purpose, and the object of my invention is to do by steam-power what is now done by the slow and tedious process of hand-labor.

The inventions set forth in the above-mentioned patents provide only for the drilling of the holes to receive the charges, while the invention described in this application provides means of covering the charges, to prevent fragments from flying, of breaking up the larger masses of rock that are thrown out by the blasts, and of raising the rock and placing it in carts to be conveyed to other localities.

The drop may also be used for breaking off points

of rock projecting from the sides of the excavation, which would otherwise have to be blasted off, and all by the power of a steam-engine which is carried upon the cart with the machinery, the same engine being applied to moving the car on the tracks.

When the holes have been drilled and charged, the engine moves the cart to the spot and drops the shield down upon the rock over the charges, as shown in fig. 1. If damage to the car be apprehended from unusually large charges, the shield can be disengaged from the car and left lying upon the rock, while the car moves away to a safe distance. When the charges have exploded, the car takes up the shield, and then moves so as to bring the drop over any stone that may have to be broken. These should be so turned as to present their largest face to the hammer, which should strike them about in the centre.

The drop swinging upon the bed-piece *n'*, on centre *n''*, may be placed over any part of the cut that the stone to be broken may happen to be in, and by means of the adjustable brace *v*, the ways may receive any desired inclination.

Thus the ways are adjustable, not only in the amount but in the direction of the inc ination.

A screw-brace may be used to support the ways, instead of the one shown at *v*, fig. 1.

The clutch *p'* being fastened to the hammer *p*, the engine put in motion, the hammer is raised to the top of the ways *o* by depressing the lever of the windlass upon which the drop-rope is wound.

As the hammer arrives at the top of the way, the connecting-rod *s* strikes against the stop *p''*, and depresses the lever *s*, which disengages the hammer from the clutch, when it falls and breaks the rock.

Lever *s'* has a hook on its lower end, which hooks into a ring in the upper end of the hammer, and when the lever which is pivoted at *s''* is depressed, the hook on its lower end lets go the hammer.

The hammer has a slightly convex face, and should weigh about five hundred pounds, and fall from ten to twenty-five feet, according to the size and strength of the stone to be broken. The stops *p''* should be adjustable along the ways *o*, so that the hammer may be let fall from any desired elevation.

When the stone has all been broken, the car is again moved so as to bring the crane in a position to raise it from the excavation and drop it into carts. For this purpose, one of the windlasses upon which the crane-rope is wound, is put in connection with the steam-power by depressing-lever *e''*, when it will run with the engine, and as the engine is a reversible one, the tub may be raised, lowered, or held stationary, without disconnecting it from the engine, simply by running the engine one way or the other, or by cutting off the steam so as to stop it. The engine may be connected with the wheels of the car, so as to propel it, by any of the usual devices. I have shown it connected by means of pulleys *f* and *f''*, and belt *f'*. The car should also be provided with a brake, as railroad-cars usually are, or it may be provided with a grapple, like the one shown in my patent above mentioned, for fastening the car to the rail.

Fig. 4 shows another method by which the drop traverses the car, which will be found useful when the excavation is of any considerable width.

The ways *b'* extend from one side of the car to the other, so that the frame *b* and the circular bed-piece *a*, with the drop upon it, may be placed over any part of the excavation. The crane, also, in case of wide excavations, should be made to traverse the car, in like manner, upon cross-ways; and both the crane and drop may be made to move across the car, by the power of the engine, by the use of similar devices to those used for raising and lowering the tub, or raising the hammer.

By turning the bed-piece *a*, an inclination in any desired direction may be given to the ways *o*, so as to accommodate the portion of the rock to be broken.

The central portion of fig. 4 shows a horizontal section of ways *o;* also a section of an auxiliary way *o''*, which is placed over the ways *o*, to prevent the hammer from falling out of them by accident. This auxiliary way should be equal in length to the ways *o*.

A very light and strong tubular guide or way for the drop-hammer, may be made of sheet-iron, with suitable longitudinal ribs or tracks inside for the hammer to slide down upon, and suitable flanches or projections on the outside, to run in support *n'''*, for the purpose of raising and lowering the tube.

The platform *c* is hinged at *c''*, and supported on adjustable screws *c'*, so as to accommodate the grade of the street in which the sewer is cut.

Whatever may be the grade of the ways *y*, the platform may be kept level by adjusting the screws *c'*.

This is equally essential to the boiler, to the crane, and to the drop.

As the excavation deepens, the ways *o* may be let down into it by windlass *w*, liding in support *n'''* on projections *a'*, so that the drop-hammer may be guided as near as possible to the stone before it leaves the ways. I allow the hammer to leave the ways before it strikes the stone, as it sometimes glances off the stone with great force, and it would be difficult to construct ways strong enough to hold it in place in such cases.

The advantage of combining in one compact, self-moving machine, all the essential elements for the purpose described, can hardly be over-estimated, as it brings within the compass of steam-power, almost all the labor of excavating rock and ore, which is now done by hand.

To make excavations such as the machinery herein described is designed for, it is necessary that the several machines should be so combined with each other and with the car, t' at they may be brought to and used with equal facility at all points where the rock is to be operated upon. In case several cellars are to be excavated between two blocks of buildings on the same side of a street, it would be necessary to lay down a track in front and in rear of the line of cellars, parallel with the street, and extending from one block of buildings to the other. Now, if the three machines, viz, the drop, the crane, and the shield, were placed each upon separate cars, it is obvious that only one out of the three could be used at each extremity of the excavation, as they could not be made to change places with each other on the track so as to bring them all, in turn, to the extreme end of the excavation; neither could the track be extended beyond the excavation at either end, so as to provide standing room for some of the machines while others were being used. It is, therefore, impossible to use the several machines at all parts of the excavation, unless they are combined in one machine and carried upon one car, to say nothing of the comparative cost of building and running the machines, as, in case of the combination, one car and one engine would do the same service that three cars and three engines would do without the combination.

Having described my invention,

What I desire to have secured to me by Letters Patent of the United States, is—

1. The shield *k*, when suspended from a car by suitable suspending-devices, substantially as and for the purpose set forth.

2. The engine *d'*, in combination with shield *k*, and any suitable devices for raising and lowering the same, substantially as and for the purpose specified.

3. The drop *n*, with its vertically-adjustable ways *o*, when carried upon a car, substantially as specified.

4. The described drop, arranged upon a platform, sliding laterally in a direction across the excavation, as and for the purpose specified.

5. The ways *o*, adjustable vertically on bed-piece *n'''*, suitably held and operated, substantially as set forth.

6. The adjustable bed-piece *n'''*, when hinged to a fixed or movable platform, and held in position by any suitable device, substantially as and for the purpose specified.

7. On the described car, carrying an engine, crane, and drop, the platform for supporting the same, when made adjustable, for the purpose set forth.

8. An excavating-machine, provided with a crane, *l*, shield *k*, and engine for operating the same, all constructed and arranged substantially as and for the purpose specified.

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