June 1, 1915.

DRAWING

1,089

A careful search has been made this day for the original drawing or a photolithographic copy of the same, for the purpose of reproducing the said drawing to form a part of this book, but at this time nothing can be found from which a reproduction can be made.

Finis D. Morris,
Chief of Division E.

AWK.

UNITED STATES PATENT OFFICE.

WILLIAM S. OTIS, OF PHILADELPHIA, PENNSYLVANIA.

CRANE-EXCAVATOR FOR EXCAVATING AND REMOVING EARTH.

Specification of Letters Patent No. 1,089, dated February 24, 1839.

To all whom it may concern:

Be it known that I, WILLIAM SMITH OTIS, civil engineer, of the city of Philadelphia, in the State of Pennsylvania, have invented certain improvements in the apparatus for and mode of excavating earth for the construction of railroads, canals, or other purposes where excavation may be necessary, which I effect by means of certain appendages to a scraper of the ordinary construction, which scraper is to be worked by a crane and is to take the earth immediately from the banks from which the excavations are to be made; and I do hereby declare that the following is a full and exact description thereof.

The drawing which accompanies this specification represents the crane, which I employ in excavating and with which I am at present operating, but I do not mean to confine myself to the exact construction and arrangement of this part, as it may be varied in its details, while the same effects may be produced by it. This crane is shown in Figure 1 as stationed upon a movable carriage, or car, and is situated on a temporary railway, and is intended to be so constructed that the load of earth taken off by the scraper may be raised by it, while the turning of the crane also to the point where the load is to be dumped, whether into cars or boxes on the road, or elsewhere, is controlled and regulated with great precision.

In the accompanying drawing, A, represents the scraper suspended from the crane, by means of the ordinary tackle; this tackle serving to raise it in the act of excavating, and to lower it when required. The end B, of this scraper is hinged to it, and has a bolt which keeps it in place when desired, or allows it to be opened and discharge its contents from that end. Such arrangements are well known to engineers and do not, therefore, require to be particularly described by me.

C, C, are two arms which are attached firmly to the scraper by means of the braces *a*, *a*, or in any other convenient mode. To these arms I connect an apparatus by means of which the scraper may be made to advance, or by which it may be drawn back at pleasure; which apparatus is worked, and a power governed in the following manner:

D is the boiler of a steam engine, which engine is not shown in the drawing, as it does not differ from others in common use. The engine gives motion to the drum E, around which is wound the chain *b*, *b*, *b*, which is connected with the scraper A, by means of tackle arranged in the ordinary way as shown in the drawing. The chain is conducted from the drum up through the column, or standard F, which supports the crane. In the side of this column there is an opening furnished with a pulley, under which the chain is conducted; and after entering this opening it passes up through the column, and through the upper arm of the crane G, where it passes over a second pulley *c*, of a particular construction, to be presently described, and which I denominate a chain pulley. This latter pulley is fixed firmly upon its shaft or gudgeon, and upon one end of this shaft or gudgeon is the bevel wheel *d*, which gears into the wheel *e*, carrying the shaft *f*, which shaft has on its lower end another bevel wheel *g*. This latter wheel gives motion to a shaft *k*, between the main braces, or lower arms of the crane H, H. This shaft and its appendages are for carrying the scraper out and in as may be required, the bevel wheel *g*, taking into a bevel wheel on the end of this shaft; the motion of the shaft *k*, is governed by a peculiarly constructed apparatus of my invention.

Fig. 2 is an enlarged view of this apparatus and of the shaft *k*, which croses between the main braces H, H, Fig. 1; *h* being a bevel wheel at one end of it, into which the bevel wheel *g*, Fig. 1 is geared, *i*, *i*, are the gudgeons which run in bearings in the arms H, H, I, is a pinion, which in my working machine, is nine inches in diameter, and gears into the spur wheel J, Figs. 1 and 3, three feet in diameter. Upon the shaft of this latter wheel is the drum K, Fig. 3, which is also situated between the main braces H, H, carrying chains in reversed directions which chains are attached respectively, to the opposite ends of the arms C, C, of the scraper; these arms rest upon the drum K, their under sides being ironed to prevent their wearing. Upon one end of the shaft *k*, Fig. 2, there is a friction belt *j*, *j*, which passes around a pulley *l*, *l*, shown also in the end view Fig. 4. The pulley *l*, *l*, and the bevel wheel which is firmly attached to it, run loosely on the end of the shaft *k*, and revolves, therefore without turning the shaft, unless the friction belt, (one end of which is firmly attached to the shaft), is tightened,

m, m, Fig. 2 is an arm which is in one piece with the shaft k, and is situated immediately within the friction pulley l, l, and to one end of this arm is attached one end of the friction belt j, j, the enlargement p, on the other end of the arm being employed merely as a counterpoise. The permanent attachment of the belt j, j, to the arm m, is shown at n, Fig. 4. The other end of the friction belt is attached to the crank lever o, and it will be manifest that by the turning of the shaft of this lever, the belt may be tightened. The apparatus for tightening this belt is constructed as follows: The shaft k, is hollow through the greater part of its length, and through this hollow passes a sliding rod, the head of which is shown at q, Fig. 2. To this head is attached a lever for the purpose of moving it in or out. This lever is seen at r, Fig. 1, and is managed by a person standing on the platform L. The inner end of the sliding rod carries a rack s, attached to it through a slot in the shaft; this rack carries a pinion t, attached to the gudgeon of which; is the bevel pinion u, which gears into the segment v affixed by its center of motion to the shaft or gudgeon of the crank lever o, Fig. 4. By this arrangement when the sliding rod is drawn out the friction belt j, j, will be tightened, and this being firmly connected to the shaft k, will carry it around, and operate the scraper in such a manner as may be required. I employ a second friction belt w, on the shaft k, which belt is tightened by means of a lever x, Fig. 1, in a manner well known to machinists, the object of this belt is to hold the drum at any desired point.

The crane is turned around to either side or portion of the bank, from which earth is to be removed, by means of a chain or band, passing around the large horizontal band wheel M, attached to it, said chain, or band being guided to, and made to embrace it, by means of pulleys on the cap timber N, as shown in the drawing; the loop, or double-turn of this chain passes around a drum operated by the engineer, which has its motion reversed, or is thrown into, or out of gear, in any of the ordinary ways of effecting that object. The crank shown at y, Fig. 1 is that, which in the working machinery is connected to the steam engine, and communicates the motion from it to the machinery.

In Fig. 5, O, represents what I have denominated the chain pulley, together with a bevel wheel d, attached to its shaft, being an enlarged view of the same pulley and bevel wheel, shown at the top of the crane, immediately above the column, or standard F, and marked e, d. This chain pulley has excavations z, z, within its groove, of such form and size as alternately to receive the flat side, and the edge, of the links of a chain of the ordinary form, as shown at 6, I have found in practice this mode of forming a chain gearing to be much superior to any of the modes hitherto in use for that purpose, while it is, at the same time, much more simple.

In using this machine it is of course to be moved forward as the excavation proceeds, and this may be done either upon a temporary rail way, or upon the ground, as may be found most convenient. When brought into use it is necessary that it should be braced laterally, and this I effect by means of a projecting bench P, on each side of the carriage, sustained by a brace Q, and having at their ends a screw R, which screw is made to bear upon blocking placed under it for that purpose. By this provision all lateral motion is effectually checked.

Having thus fully described all those parts of my excavating crane which I believe to be new and indicated the manner in which these improvements are connected with the ordinary gearing, by which cranes are or may be operated upon by any motive power, such as steam, animals, or men, without deeming it necessary to offer any description of the manner in which the general gearing is effected, as this may be varied according to the judgment of the constructor, and is such as is well known to every competent machinist. And although the improvement consists mainly in the manner in which I employ the scraper for excavating, by means of the crane, I do not make any claim to the mere using of the scraper by means of the crane, this having been before done; but

What I do claim in the before described apparatus is—

1. The application of power to force the scraper forward against a bank in the act of excavating and to withdraw it at pleasure, by the aid of a barrel, chains, and other apparatus, constructed and operating substantially in the manner herein described, by which its sudden recoil will be prevented when it encounters any unusual resistance, and this I claim whether the apparatus be arranged exactly in the manner set forth, or in any analogous way, by which the same result will be attained.

2. I claim also the general combination of the friction belt around the pulley upon the shaft k and the apparatus for tightening the same, or of allowing it to run loose for the purpose and in the manner described.

WM. S. OTIS.

Witnesses:
THOS. P. JONES,
W. THOMPSON.