(No Model.) 2 Sheets—Sheet 1.

F. N. CONNET.

CRANE.

No. 563,259. Patented July 7, 1896.

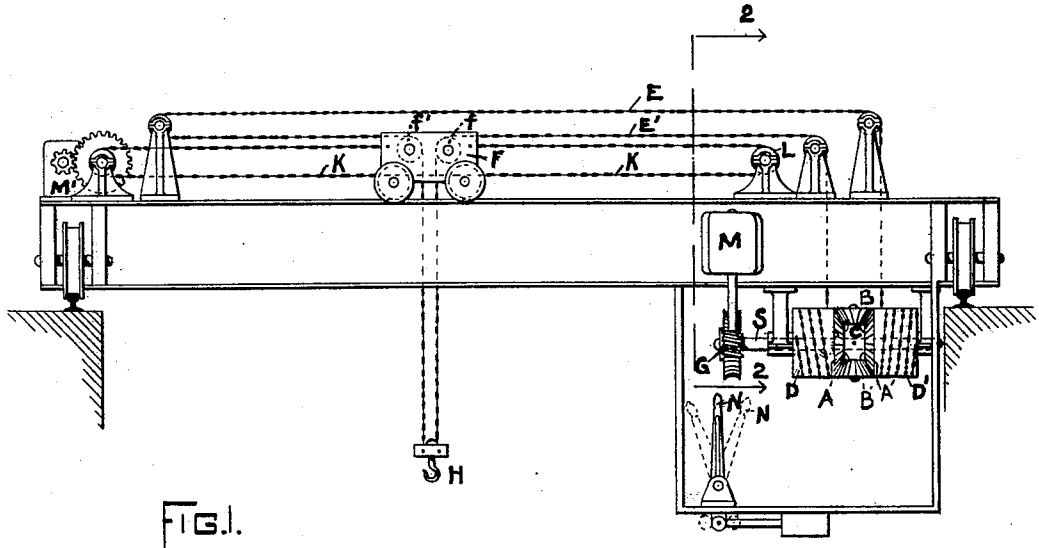

FIG. 1.

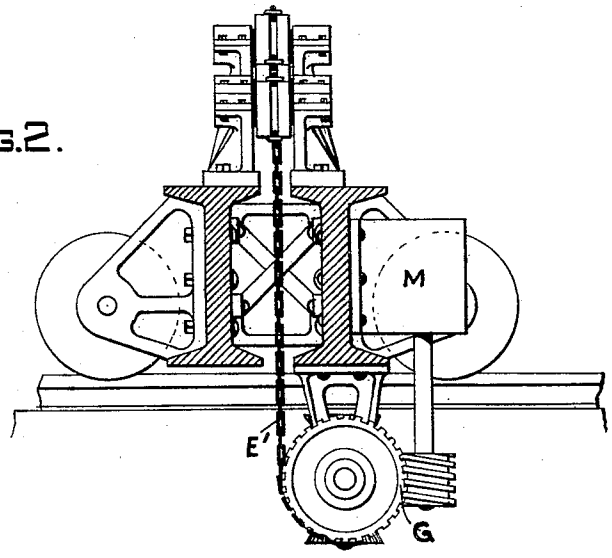

FIG. 2.

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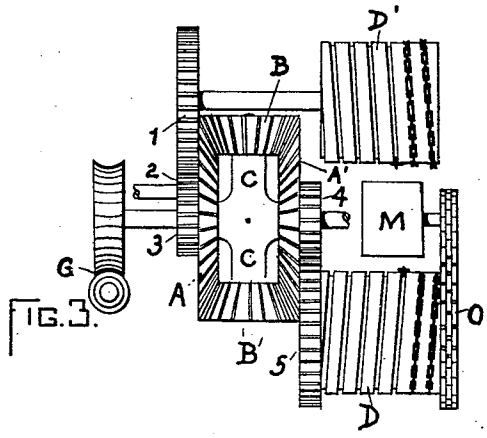


FIG. 3.

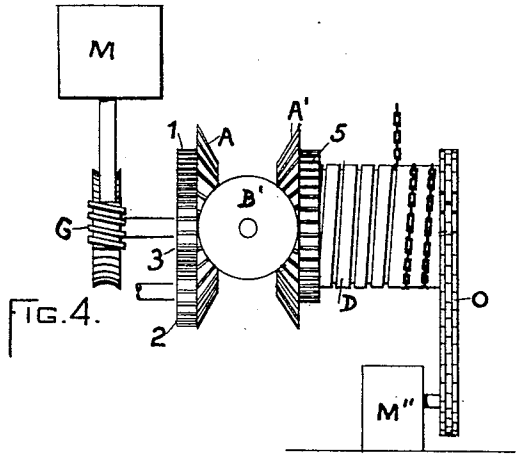
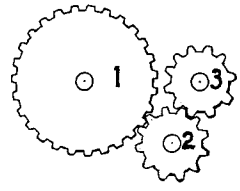


FIG. 4.

FIG. 5.



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UNITED STATES PATENT OFFICE.

FREDERICK N. CONNET, OF PROVIDENCE, RHODE ISLAND.

CRANE.

SPECIFICATION forming part of Letters Patent No. 563,259, dated July 7, 1896.

Application filed January 17, 1896. Serial No. 575,859. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK N. CONNET, a citizen of the United States, residing in the city and county of Providence and State of Rhode Island, have invented a new and useful Improvement in Cranes, of which the following, with the accompanying drawings, hereby made a part hereof, is a description.

My invention relates to that class of cranes in which the hoisting-chains are wound upon two drums and both are necessarily rotated in both hoisting and trolleying; and it consists of a crane operated by two such drums, two motive powers, and a set of gearing of a form well known in mechanics and which is called by various names, according as it is used for one purpose or another, and in combinations of several of these parts. In a previous application for a patent filed by me on September 7, 1894, and being Serial No. 522,345, I have described combinations of essentially the same elements and have therein called the set of gearing "equational" gearing. In this application I prefer to call it "compensating" gearing, as more nearly describing its function in these combinations.

Referring to the drawings, Figure 1 is a view of a traveling crane embodying my invention; Fig. 2, a view at right angles to Fig. 1 and on line 2 2 of that figure, looking from the middle of the crane, and the figure being partly in section. Figs. 3, 4, and 5 represent modified arrangements of the principal elements of the invention.

Referring to either Fig. 1 or Fig. 3, it will be seen that the gearing, herein called "compensating" gearing, consists of three main features, all concentrically mounted, namely, the two large outer bevel-gears A and A′ and the intermediate framework C, consisting of arms with the beveled pinions B and B′ mounted loosely upon them and meshing with the main gears. A consideration of this gearing will show that each of these three elements may be connected to other mechanical devices in various ways to obtain various results. In my previous application above referred to I have shown the two main gears of such a gearing connected with two sources of motive power, and the intermediate framework with its pinions connected to a drum of the crane to drive it. In this application I reverse the points of connection as respects drums and motive power, connecting the drums to the main gears of the gearing and the motive power used for hoisting to the intermediate framework, and then add a second and independent motive power to accomplish the trolleying. This latter arrangement will be readily understood from the following description:

In Figs. 1 and 3, D and D′ represent the two hoisting-drums, preferably, though not necessarily, located at one end of the bridge where used in a traveling crane, upon which the hoisting-chains E and E′ are wound, one upon each drum, but in such a manner that they will be both wound or unwound by rotating the main gears of the compensating gearing in the same direction. One of these chains, as E′, it being immaterial which, passes over suitable sheaves directly to the truck or trolley F, and passing over the sheave *f* in the truck is fastened to the hoisting-hook H. The other chain, as E, passes first to the other end of the bridge and thence back over the truck-sheave *f′*, and is also attached to the hoisting-hook.

As shown in Fig. 1, the two drums D and D′ are mounted loosely upon the shaft S and each is attached to one of the main gears of the compensating gearing, and the intermediate framework C, carrying the pinions, is keyed to the same shaft S. Power is then applied to this shaft, preferably by an electric motor M, by means of the worm and gear G. This worm should be strongly mounted to resist the rotation of the drums when not driven by the motor under the strain imparted by the load on the crane. Other appliances may be substituted for the worm to accomplish the same purpose, as an electric brake or brakes, which shall be automatically applied whenever the current to the motor is cut off, applied either to the intermediate framework or elsewhere, and other motive power may be substituted for the electric motor; but I prefer the arrangement of the motor and worm here described. A second motor M′ or other motive power is then arranged to move the truck back and forth on the bridge, that is, give the trolleying action required in a practical crane. This second motor may be indifferently placed in various positions and ar-

ranged in a number of ways to accomplish this result. In Fig. 1 I have shown it located at one end of the bridge driving a suitable chain wheel or drum, which in turn is connected by the endless chain K, running over it, to the truck or trolley F, one end of the chain first running around the sheave L at the opposite end of the bridge. It is evident, however, that this motor or motive power may also be mounted upon the trolley or truck itself, and it could as well operate a screw running along the bridge and working in a nut fixed upon the trolley, or, if mounted upon the trolley, operate the nut upon a fixed screw, and thus effect the same result. Still another position and connection for this motor will be hereinafter mentioned. The better place for this motor, however, is, as shown, at one end of the bridge, although it is entirely immaterial at which end it is placed, except as influenced by the exact arrangement and proportions of the parts, since there is no difficulty in such cases in conducting the electric wires controlling it to any point which may be most convenient for the operator to control in connection with the other or hoisting motor.

It is to be understood that the motors are controlled in speed and direction of rotation by suitable resistance-coils and reversing mechanism, the forms of which are well known to electricians, and by means of levers, as N, Fig. 1, or other appropriate means conveniently placed to permit the operator to see the direction taken by the load.

The operation of this mechanism is as follows: The strain due to the load as transmitted by the chains comes equally upon both drums. If then the chains are properly placed upon the drums, the tendency of each will be to rotate the main gears of the compensating gearing in the same direction and therefore to rotate the entire framework and pinions between them upon its shaft; but this tendency on the part of the intermediate framework and pinions to rotate is prevented by the worm G, or other means employed for this purpose when the motor is at rest. When the motor M is run in the proper direction either for hoisting or lowering, the motion is transmitted equally to both drums, the strain of the load being equally balanced on both. In any of these cases the pinions B and B′ will not rotate. When, however, it is desired to trolley, and the motor M′ is operated to run the truck or trolley upon the bridge, the action will cause one or the other of the hoisting-chains E or E′ to be pulled from its drum and consequently will cause that drum to rotate. Whichever drum, however, thus rotates will by means of the main gears of the compensating gearing and the pinions between them cause the other drum to rotate in the opposite direction at the same speed, and thus cause the chain on that drum to be pulled in to an equal extent that the other is unwound, the framework in this case remaining stationary and the pinions only rotating on their axes. The result upon the load will be to trolley it in one or the other direction without giving any vertical movement to it. It is not of course necessary, however, that either the hoisting or trolleying take place at different times, but both may be done at the same instant and at any varying speeds desired, so that the load may be thus made to take any direction desired in the perpendicular plane of the bridge.

The arrangement shown in Fig. 1 is perhaps the simplest one; but it takes considerable room lengthwise of the bridge, which may frequently be objectionable. A more concentrated arrangement is shown in Figs. 3, 4, and 5, where the same letters represent the same parts so far as used except that the second or trolleying motor is represented by M″. Here each drum and the compensating gearing are mounted on separate shafts. Each drum is connected by gears (shown as 1, 2, 3, 4, and 5) to one of the main gears of the compensating gearing, these latter being loose upon their shaft, and the worm driven by the hoisting-motor and the framework being keyed to it.

As here shown, the chains are wound on the two drums in opposite directions instead of the same direction, as shown in Fig. 1. They are thus shown in order to bring them as nearly in the center of the bridge as possible; but with such winding it is necessary to insert an additional gear, as 2, between one of the drums and its main gear of the compensating gearing in order to reverse the rotary direction of the strain which will be transmitted to the compensating gearing. Various other arrangements may also probably be made to suit special conditions; but in the arrangement of this application the two drums must always be connected to the main gears of the compensating gearing either by being directly fastened to them or by means of shafts, gearings, or other equivalent means inserted between them, and the hoisting-motor must be connected in some similar way to the intermediate element or framework.

From the foregoing description of the operation of the combination it will be seen that the motive power effecting the trolleying might be applied directly to one of the drums to rotate it as desired, since whatever motion is thus given to one will be transmitted in the reverse direction to the other; but such motive power and its connections must be so constructed as to permit perfect freedom of rotation of the drum when hoisting or lowering, and if it is constructed, as it should be, with permanent connections always in operative position, the means transmitting or causing this rotation when trolleying must itself rotate when the hoisting-motor is alone used. Such an arrangement is shown in Figs. 3 and 4, where M″ represents the motor connected to one drum by the chain O running

over sprocket-wheels. For the reason that this motor must be free to rotate when hoisting and the additional one that the speed of electric motors as at the present time constructed must ordinarily be much reduced in transmission, and thus cause considerable inertia to be overcome upon one drum which is not upon the other, and consequently make the resistance of the two unequal, I prefer to connect the motor, as shown in the main drawings, directly to the truck or trolley.

It is advantageous generally to place the drums lengthwise of the bridge in trolleying-cranes and then feed the chains upon the drums. The mechanism for accomplishing this is fully described and claimed in my pending application referred to in the early part of this specification, and although my invention is here described as applied to traveling cranes, it will be well understood upon consideration of my other application that the arrangement herein described may also be advantageously applied to jib-cranes. Wheels constructed to engage the chains running over them may of course take the place of drums, and ropes the place of chains. It is therefore to be understood that these are included in the claims. The term "motive power" is meant to include shafts transmitting power as well as electric motors or other independent sources of power.

I claim as my invention—

1. A hoisting and trolleying crane operated by the combination of a set of compensating gearing substantially as described, two drums each connected with one of the main gears of the compensating gearing to be driven by it, a motive power connected to the intermediate framework of the compensating gearing, and means for preventing the rotation of the drums under the strain of the load when not being operated by the motive power already mentioned, and by a second motive power arranged to effect the trolleying, substantially as described.

2. A hoisting and trolleying crane operated by the combination of a set of compensating gearing substantially as described, two drums each connected with one of the main gears of the compensating gearing to be driven by it, a motive power, and a worm and gear connecting the motive power with the intermediate framework of the compensating gearing, and by a second motive power arranged to effect the trolleying, substantially as described.

3. A hoisting and trolleying crane operated by the combination of a set of compensating gearing substantially as described, two drums each connected with one of the main gears of the compensating gearing to be driven by it, a motive power, and a worm and gear connecting the motive power with the intermediate framework of the compensating gearing, and by a second motive power connected to the truck or trolley by suitable means for moving it back and forth, substantially as described.

4. In a crane the combination of a set of compensating gearing substantially as described, two drums each connected with one of the main gears of the compensating gearing to be driven by it, a motive power connected with the intermediate framework of the compensating gearing, and means for preventing the rotation of the drums under the strain of the load upon them when not being operated by said motive power, and of a truck or trolley carrying sheaves, chains running over the trolley-sheaves and connecting each drum with the hoisting-hook in the manner described, said chains being placed upon the drums in such manner as to tend to turn the main gears of the compensating gearing in the same direction, and a second motive power arranged to effect the trolleying, substantially as described.

5. In a crane the combination of a set of compensating gearing substantially as described, two drums each connected with one of the main gears of the compensating gearing to be driven by it, a motive power, and a worm and gear connecting the motive power with the intermediate framework of the compensating gearing, and of a truck or trolley carrying sheaves, chains running over the trolley-sheaves and connecting each drum with the hoisting-hook in the manner described, said chains being placed upon the drums in such manner as to tend to turn the main gears of the compensating gearing in the same direction, and a second motive power arranged to effect the trolleying, substantially as described.

6. In a crane the combination of a set of compensating gearing substantially as described, two drums each connected with one of the main gears of the compensating gearing to be driven by it, a motive power, and a worm and gear connecting the motive power with the intermediate framework of the compensating gearing, and of a truck or trolley carrying sheaves, chains running over the trolley-sheaves and connecting each drum with the hoisting-hook in the manner described, said chains being placed upon the drums in such manner as to tend to turn the main gears of the compensating gearing in the same direction, and a second motive power connected to the trolley by suitable means to move it back and forth, substantially as described.

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Witnesses:
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H. J. BURROUGH.