O. C. CARPENTER.

Compound Hydraulic Engine.

No. 210,915. Patented Dec. 17, 1878.

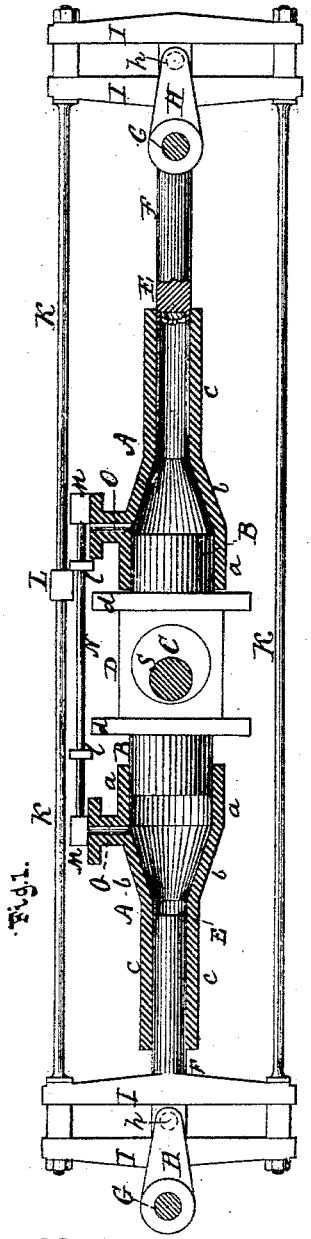

Fig. 1.

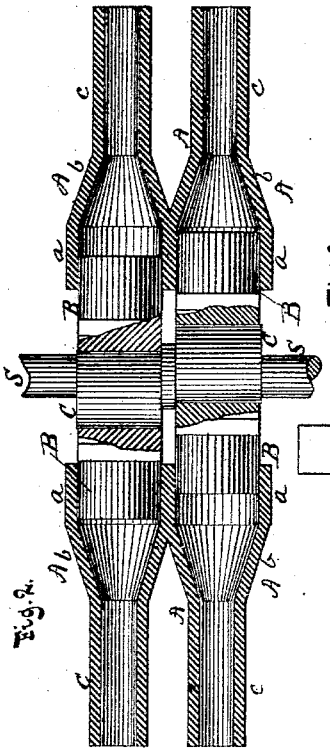

Fig. 2.

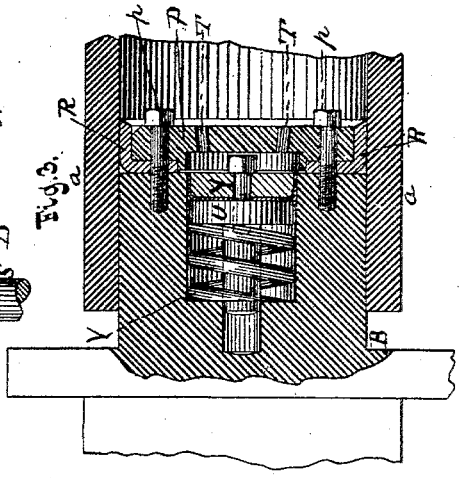

Fig. 3.

Witnesses.

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UNITED STATES PATENT OFFICE.

ORAMILL C. CARPENTER, OF BROOKLYN, E. D., ASSIGNOR TO ROBERT FARLEY, JR., OF NEW YORK, N. Y.

IMPROVEMENT IN COMPOUND HYDRAULIC ENGINES.

Specification forming part of Letters Patent No. **210,915**, dated December 17, 1878; application filed December 24, 1877.

To all whom it may concern:

Be it known that I, ORAMILL C. CARPENTER, of Brooklyn, E. D., in the county of Kings and State of New York, have invented certain new and useful Improvements in Compound Hydraulic Engines, of which the following is a specification:

My invention relates to improvements in machines for imparting motion by means of hydraulic pressure; and the invention consists, essentially, in the combination and arrangement of certain cylinders of peculiar construction and form with pistons, eccentric, and block and rods; also, in the employment of an elastic piston in connection with the liquid used in the cylinder.

Another important feature consists in an arrangement of valves in connection with the cylinders for feeding the liquid to the cylinders, and for relieving the same of a surplus, all of which will be more fully hereinafter set forth.

In the drawings, Figure 1 is a longitudinal vertical section taken through a pair of cylinders in a machine embodying my invention. Fig. 2 is a horizontal section through the cylinders, showing two pairs of the same arranged side by side. Fig. 3 is an enlarged sectional view of the piston, showing the construction of the elastic portion.

A A represent cylinders of a differential character, each having an enlarged portion, *a*, a reducing portion, *b*, preferably funnel-shaped, and a portion, *c*, of reduced diameter, as shown. A pair of these cylinders are arranged with their larger ends opposed, and into them are fitted plungers or pistons B B. These are connected rigidly together, by preference, and between them is fitted a sliding block, D, fitted to an eccentric, C, on a cross-shaft, S. This arrangement is such that when the shaft S is rotated, the eccentric, acting through the block D, causes the pistons B B to play back and forth in the portions *a a* of the cylinders, advancing in one and receding in the other simultaneously.

In the smaller portions, *c c*, of the cylinders are fitted pistons F F, which are connected together by means of the yokes I I and rods K K. Between the pistons B F in the funnel-shaped portion *b* is the liquid used, which may be oil, if preferred. The yokes I I embrace sliding blocks on the wrists *h h* of cranks H H on crank-shafts G G.

The operation is as follows: Rotary motion being imparted to the shaft S, it is communicated, through the eccentric C, to the pistons B B, the travel of the latter being equal to the throw of the eccentric. The diameter of the large portion, *a*, of the cylinder is in such relative proportion to the diameter of the smaller portion, *c*, that as the plunger B moves through a short distance in the cylinder a sufficient amount of liquid will be displaced to force the piston F a greater distance through the portion *c*. Thus the cross-heads or yokes, the cranks H H, and the shafts G G are set in motion.

I prefer to arrange two pairs of cylinders, A A, side by side, as shown in Fig. 2, and to fix the eccentrics on the shaft S at right angles, so as to avoid centers; and in such an arrangement the cranks H H in one set would, of course, be arranged at right angles to those in the other. This arrangement gives a much smoother motion than when only one pair or set is used.

Upon the side of each cylinder is a feed-inlet, O, provided with a slide-valve, M. The valves of each pair of cylinders are connected by a rod, N, and are so arranged that as one inlet is opened the other will be closed. On the rod N are projections *l l*, and on the upper rod, K, are adjustable blocks or dogs L, which, as the rods K move back and forth with the pistons, strike the projections *l l* and move the valves so as to alternately open and close the apertures or ports O.

The valves should, of course, be provided with chests in the ordinary way, which chests should be connected by pipes with a suitable reservoir of oil or other liquid, conveniently located at such a height as to give the requisite pressure for the feed.

The valve of each cylinder is designed to be opened at the limit of the outward throw of the pistons, so as to supply any deficiency of oil. The valves serve also to relieve the cylinders of any surplus oil, and act both as a feed and relief for the cylinders. This is essential to insure a uniform motion.

To enable the pistons or plungers to act readily in passing centers, I construct the

former as shown in Fig. 3. A recess or opening is made in the head of the plunger, in which is fitted a stout spiral spring, V, which bears against an inclosed piston, U, to which is bolted the cup Y, provided with suitable leather packing. P is the main cup or head of the plunger, which is provided with the packing R. The main cup P is secured to the plunger B by means of screws or bolts *p p*. T T represent holes through the main cup P, to admit of the passage of the oil from the cylinder to the interior piston.

My invention is designed to be applied to a street-railway car, and power is to be applied to the shaft S to move the pistons by steam or other suitable means. The reciprocatory movement of the pistons may also be utilized for various purposes without the intervention of the cranks.

What I claim as my invention is—

1. The combination of the following elements, viz: the two cylinders A A, arranged with their larger ends opposed, the pistons B B F F, coupled together, substantially as shown, the eccentric C, block D, and shaft S, all arranged to operate in connection with the interposed liquid, substantially as set forth.

2. The combination of the cylinders A with valves M, adapted to admit liquid to the liquid-space in the cylinders and give relief to the cylinders when overcharged, said valves being arranged to operate in unison with the pistons B F, substantially as set forth.

3. The combination of the cylinder A with a piston having an elastic center, constructed and arranged to operate substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

O. C. CARPENTER.

Witnesses:

J. H. ADAMS,

A. H. KIDNEY.