No. 809,633. PATENTED JAN. 9, 1906.

E. F. SCHEIBE.

SUBMARINE MINING.

APPLICATION FILED MAR. 1, 1905.

4 SHEETS—SHEET 1.

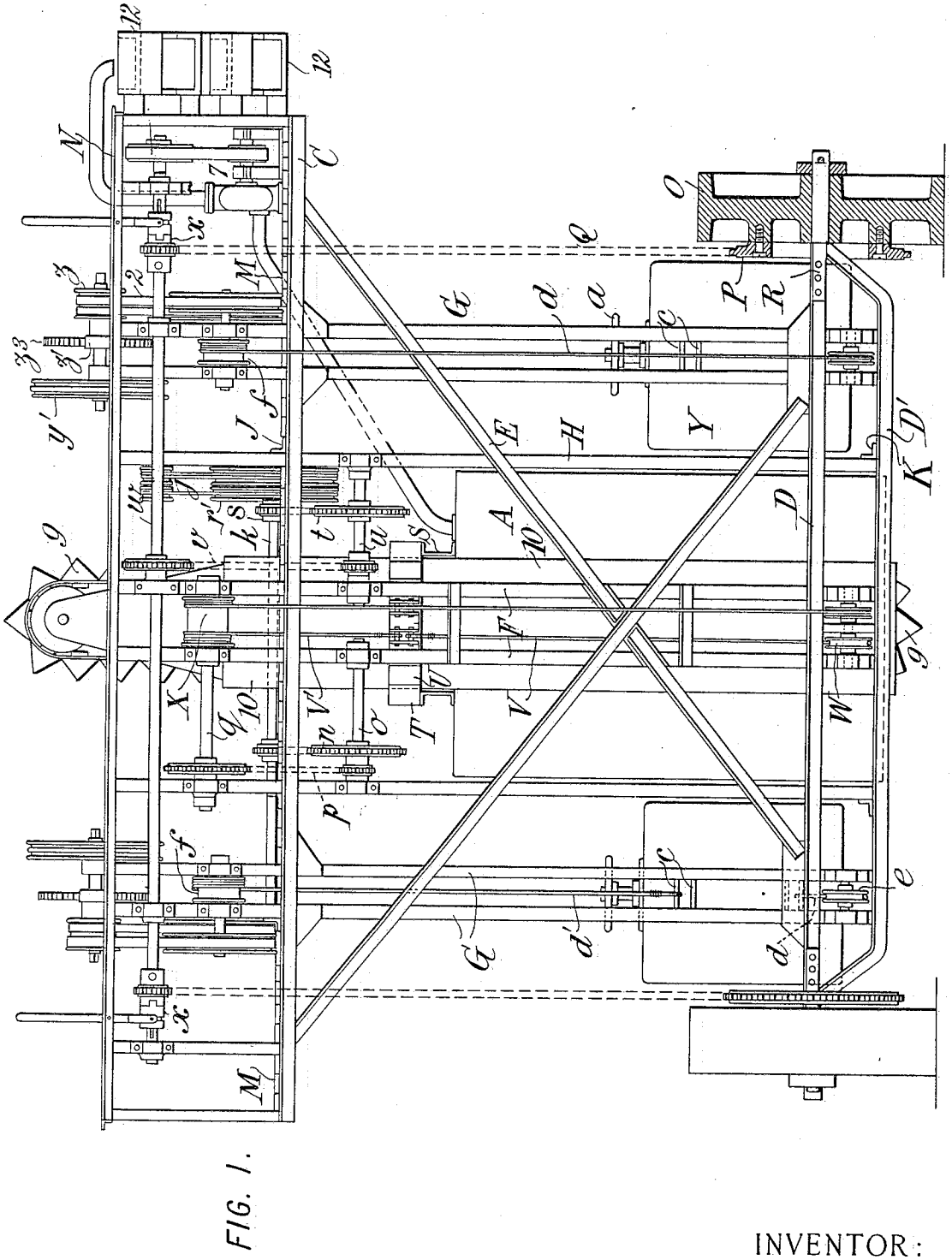

FIG. 1.

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4 SHEETS—SHEET 2.

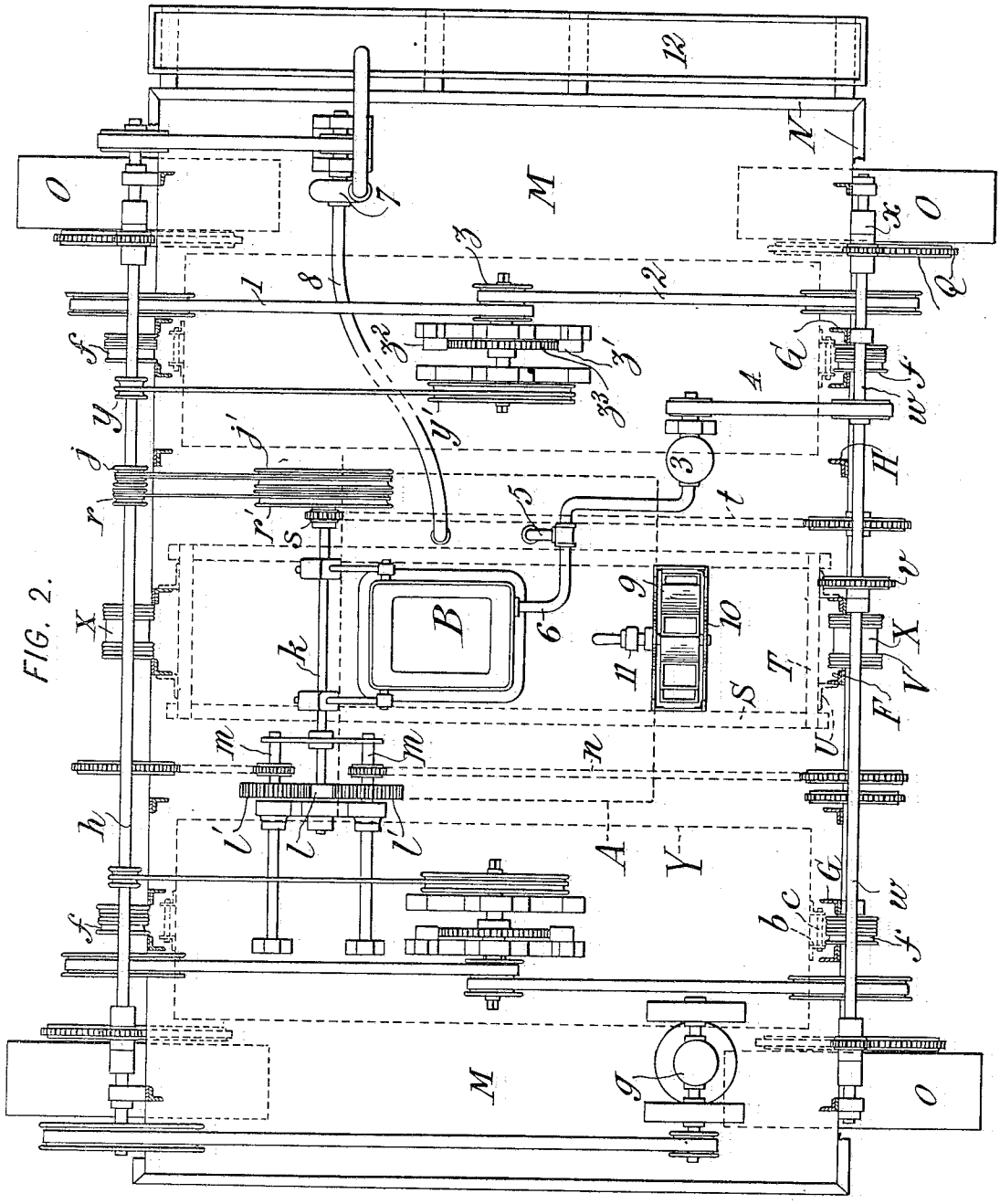

FIG. 2.

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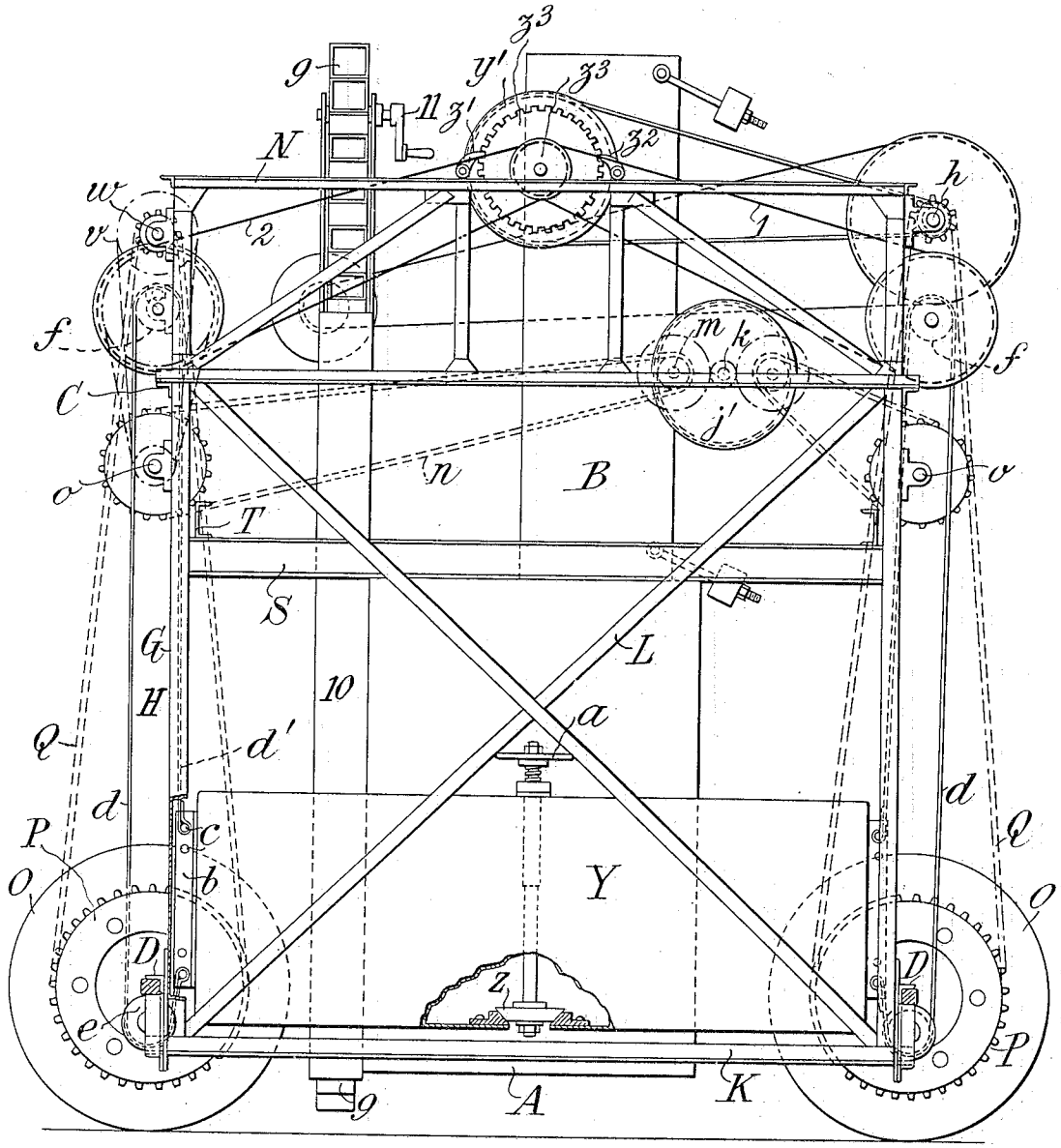
4 SHEETS—SHEET 3.

FIG. 3.



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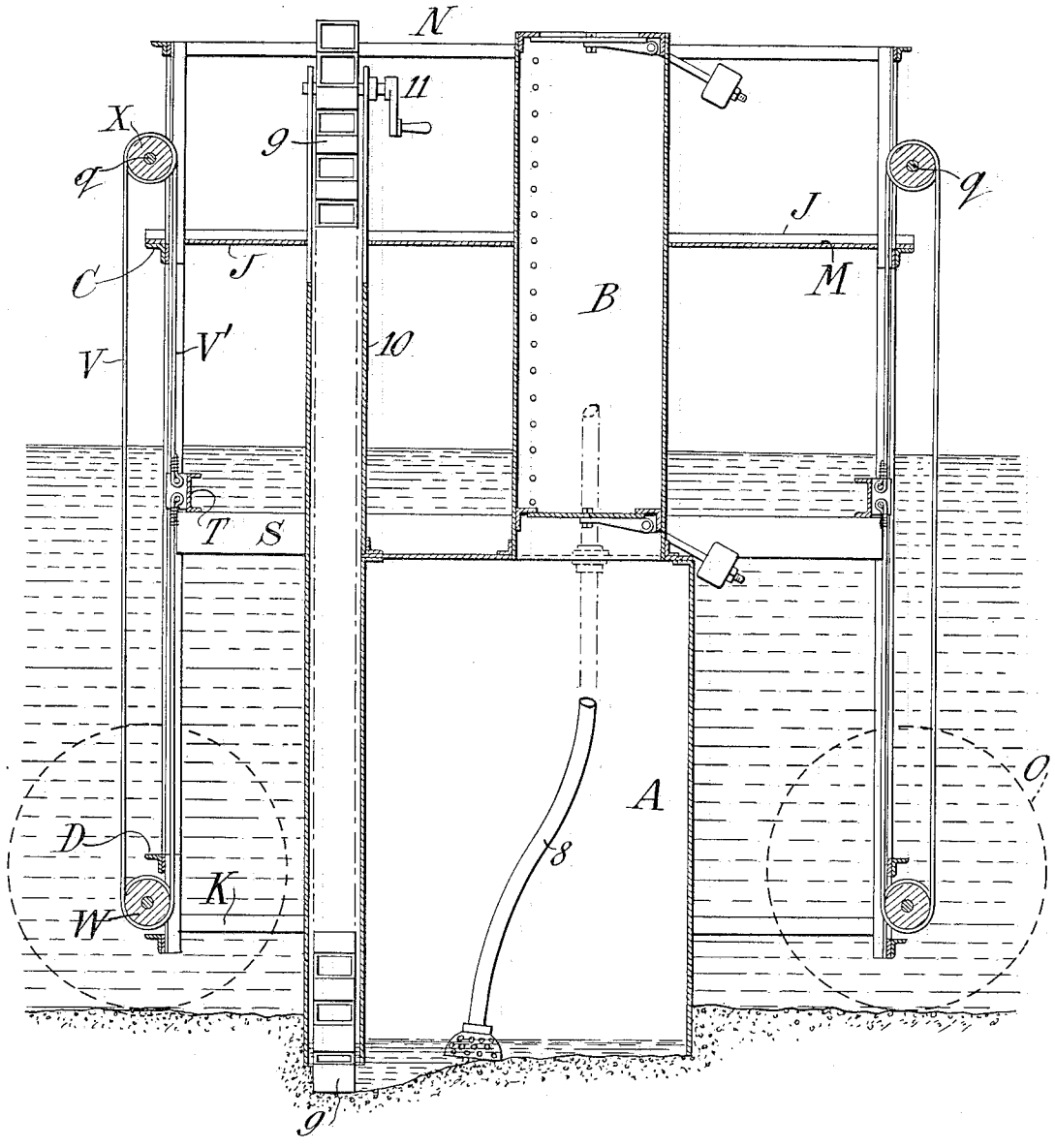
4 SHEETS—SHEET 4.

FIG. 4.



WITNESSES:

Fred White

Ren. Bruine

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UNITED STATES PATENT OFFICE.

EDGAR F. SCHEIBE, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO SUBMARINE GOLD MINING COMPANY, A CORPORATION OF NEW YORK.

SUBMARINE MINING.

No. 809,633. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed March 1, 1905. Serial No. 247,904.

To all whom it may concern:

Be it known that I, EDGAR F. SCHEIBE, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Submarine Mining, of which the following is a specification.

It is well understood that in mineral-bearing sands under water there is a gradual sifting of the heavy mineral downward until it strikes a stratum of rock, hard pan, or clay too dense to be penetrated. For example, on the beach at Nome, Alaska, it is found that practically all of the gold has collected in a stratum of sand generally only a fraction of an inch deep and lying immediately upon a stratum of impermeable blue clay at a depth of a few feet below the surface of the beach. Similar deposits are found in numerous river-beds and presumably wherever the same conditions occur. It has been attempted to obtain the gold from such sands where they are permanently under water by various dredging operations. It has also been proposed to dredge out the upper worthless portion of the sand and to then sink a caisson and recover the gold-bearing sand by hand. These processes all have the fatal disadvantage that the depth to which the dredging apparatus digs cannot be observed from above the water and that the operation of the dredgers when they reach approximately the level of the "pay dirt" creates such a disturbance under the water as to scatter the gold all about instead of taking it up in the buckets.

According to this invention the operator excavates the worthless sand in a caisson from which the water has been expelled, and thus has the work immediately under observation by his eyes and under control by his hands, so that he can accurately determine and regulate the removal of the worthless dirt and can throw this overboard without further consideration. It is only necessary, therefore, to sluice the pay dirt, whereas in previous processes it has been necessary to sluice practically all the sand raised, because of the disturbed condition created by the dredge operating at an invisible point below the water. The value of this difference will be readily understood when it is considered that the worthless dirt may be from three to ten feet or more deep and the pay dirt only a half-inch deep.

The proposed apparatus includes a caisson in which the operator works. In order to permit the use of the caisson in rough water, it is supported upon the bottom and is moved about from place to place along the bottom, an intermediate support being provided which always rests directly on the bottom, while the caisson may be moved up and down relatively thereto, so as to extend to any desired depth. A platform is preferably provided at the top of said support, so as to be ordinarily out of the reach of waves, and suitable tanks are carried by the support and adapted to be filled or emptied and to be raised or lowered, so that they may serve as weights or as floats to lighten said support. Preferably, also, a sand-elevator passes down along the outside of the caisson to a point approximately level with the lower edge of the caisson and is used for removing the worthless top layer of sand and also the pay dirt, if desired.

Certain other improvements are referred to in detail hereinafter.

The accompanying drawings illustrate a suitable form of the apparatus.

Figure 1 is an end elevation thereof. Fig. 2 is a plan. Fig. 3 is a side elevation. Fig. 4 is a vertical section more or less diagrammatic through the caisson and sand-elevator.

No indication is made in Fig. 2 of the floor, except by the indication of the matters below it in dotted lines. Throughout the drawings various other parts the construction of which is obvious and is not necessarily a part of the invention have been omitted for the sake of clearness.

Referring to the apparatus illustrated, the caisson A is an open-bottomed shell with a roof from which proceeds a shaft B, having inwardly-opening gates at top and bottom, so as to constitute an air-lock. The construction of these is not illustrated in detail, being a matter of common knowledge and being susceptible of considerable variation. The "support," through the intermediation of which the caisson rests upon the bottom, is illustrated as a framework made up of

structural steel. For example, the end frames may have as their principal members the upper and lower horizontals C and D, connected by diagonals E (omitted except in Fig. 1) crossing each other. As stiffeners for the end frame and as supports for various parts of the mechanism there may be provided also a central pair of verticals F and two side pairs of verticals G. The side frames may comprise verticals H, fastened to the end frames, each side frame being completed by top and bottom horizontals J K and crossing diagonals L. The side frames are preferably arranged in planes between the caisson A and the tanks hereinafter described, so as to permit free vertical movement of the caisson and tanks without interference with each other. In order to strengthen the end frames at the bottom, and especially to provide supports for certain sheaves hereinafter described, a supplementary lower horizontal D′ is provided, and preferably also the various verticals F, G, and H, extend down to the supplementary lower horizontal D′, thus making the structure of great strength at the bottom.

At the upper end of the apparatus there is a platform M, illustrated as made of planks, the ends of which rest on the end horizontals C. This platform supports the various mechanisms for operating the apparatus and is preferably provided with a rail N, connected to the horizontal members C and J of the frame by various extensions of the verticals previously described and by various short verticals and oblique braces, as illustrated, the several verticals between the members C and J on the one hand and N on the other hand serving also to support various winches, pulleys, and the like.

The supporting-frame rests directly on the bottom under all normal conditions, and the apparatus is moved from place to place by suitably raising the caisson out of the hole in which it has previously been sunk and then shifting the supporting-frame and caisson about on the bottom. For the purpose of more easily moving the apparatus the supporting-frame is provided with large broad-rimmed traction-wheels O, one at each corner. By means of these traction-wheels it is proposed to run the apparatus down from the beach into the water a sufficient depth and then to move the apparatus step by step up again toward the beach as the successive sections of the water-covered sand are excavated and sluiced. The movement of the apparatus may be controlled by a cable or cables attached to a fixed point on the shore or by various other mechanisms. I prefer, however, to have traction-wheels O driven by mechanism on the platform or deck of the apparatus. For example, the wheels may be provided with sprockets P, driven by sprocket-chains Q, operated from above. The wheels may be supported in any suitable manner upon the frame—as, for example, by bolting an end of the axle R to the end of the lower horizontal D of the end frame.

In order to control and guide the caisson from the supporting-frame, the former is preferably provided with a pair of channel-irons S, extending over the roof of the working chamber or caisson proper and connected at their ends by means of cross-bars T, which are provided with angle-irons U, engaging the vertical guides F. For lifting or lowering the caisson a pair of cables V are provided at each end. These cables pass from the point of attachment to the cross-bar T, down to pulleys W at the lower end of the frame, and thence up on the outside of the frame to a drum X on the platform, similar cables V′ being extended upward from the cross-bar T to the same drum. The greatest strain is necessary in pulling down the caisson, and the arrangement of the cables V so as to pass around pulleys W, and thus pull down, is much more efficient, compact, and simple than previous arrangements in which it has been proposed to push down the caisson from a point of resistance overhead.

In forcing down the caisson it is desirable at times to apply considerable weight. On the other hand, it is desirable to keep the weight of the complete apparatus as low as possible consistent with safety, so as to permit the ready removal of the apparatus from one point to another. There is provided, therefore, means for increasing or decreasing the weight of the supporting-frame (and therefore of the entire apparatus) at will and within a very wide range. For this purpose a pair of sheet-metal tanks Y is provided, each having a valve Z in its bottom operated by means of a hand-wheel *a*, projecting out of its top. The tanks are vertically movable, so that they may be filled with water and in that condition lifted to a point immediately below the platform and above the level of the surrounding water, so as to add their great weight to that of the supporting-frame in the forcing down of the caisson. On the other hand, when it is desired to lighten the apparatus, either to permit it to be easily moved from place to place or to resist the downward pull upon the frame when the caisson is being pulled up or even to permit the floating of the frame and complete apparatus from one place to another, (an operation contemplated when the apparatus is used in smooth water,) the tanks may be emptied and the valves closed, thus converting the tanks into floats of large capacity. The floats may then be pulled down until they are completely submerged, whereupon they will have a lifting effect in proportion to their capacity, as is well understood. The method of lifting and lowering the tanks Y is analogous to that of lifting and lowering the caisson. At each end of

each tank a pair of vertical angles *b* is provided projecting within the vertical guides G of the main frame. Pins *c* extend between the angles *b* and serve as points of attachment for cables *d*, running downward from the tank to the bottom sheave *e* and thence upward to a drum *f*, and similar cables *d'*, running directly upward to the drum *f*. (The cables running upward from the pulleys W and *e* are shown in the right-hand half of Fig. 1 and omitted from the left-hand half for the sake of clearness.)

The operating mechanism of the various parts of the apparatus may be very largely varied. The arrangement proposed is best indicated in Fig. 2, the various parts being shown more or less diagrammatically, as their specific construction is well understood in the art. The prime source of power is a gasolene-engine *g*. From the belt-pulley of this engine power is transmitted to a corresponding pulley on the first shaft *h*, so that the latter revolves at a moderately slow speed. From this shaft *h* power is taken by means of winches *j j'* to a second shaft *k*, which by means of a pinion *l* drives in opposite directions pinions *l'* on shafts *m*, which connect by sprocket-chains *n* with short shafts *o*, one at each end of the apparatus. The shaft *o* is for the purpose of reducing the speed and carries a small sprocket-wheel which connects by means of a sprocket-chain *p* with a large sprocket-wheel on a shaft *q* of the drum X, which lifts and lowers the caisson. Returning now to the first shaft, power is taken by means of winches *r r'* to a sleeve *s*, rotating freely on the shaft *k* and from which power is transmitted by means of a sprocket-chain *t* to a shaft *u*, which is connected in turn by means of a sprocket-chain *v* to a long shaft *w*, which drives the sprocket-chains Q for operating the several traction-wheels O. A clutch *x* is provided for releasing each of the traction-wheels O from the power-shaft, so as to turn the apparatus. Returning again to the first shaft *h*, power is taken by means of winches *y y'* at each side to a central drum *z*, whence by a pair of belts 1 and 2 power is conveyed to the drums *f* for hoisting the tanks. The drum *z* is held in any desired position by means of one or the other of the pawls *z' z²*, which is thrown into engagement with the teeth of a wheel *z³*, fixed on the shaft of the drum. An air-pump 3 is driven by a belt 4 from the shaft *w* and is connected, by means of pipes 5 and 6, with the working chamber and shaft or air-lock of the caisson. A suction-pump 7 is also driven by a belt from the shaft *h* and carries a hose 8, leading down into the working chamber.

An important feature of the invention is the removal of the top worthless layer of sand by the operator within the caisson, where he can observe clearly the limit of depth to which it extends and can avoid the disturbance of the lower gold-bearing stratum. The top layer is preferably removed by means of an elevator, which extends down along the outside of the caisson to a point approximately level with the lower edge of the caisson. For example, a chain-and-bucket elevator is indicated typically at 9, working in a divided shaft 10, not necessarily water-tight, but serving to prevent the sand from entering in substantial quantities except at the bottom. The chains are operated from a hand-crank 11, accessible from the platform or by any suitable connection to the power-shaft. Fig. 4 shows the arrangement at the lower end of the caisson in section.

The pay-dirt may be sluiced directly as it is drawn up from the bottom of the caisson, or it may be stored and carried ashore to be sluiced. A suitable arrangement for sluicing immediately consists of a series of sluice-boxes 12, arranged in any suitable manner at one side of the platform. (Omitted from Fig. 3.) The discharge from the suction-pump 7 is directly into the uppermost sluice-box 12, whence the water and sand are run down back and forth and the residual material thrown directly overboard. Any suitable mechanism for adjusting the slope of the sluice-boxes may be utilized.

The operation of the various parts of the apparatus will be understood from the foregoing description. Briefly stated, the operation of the complete apparatus is as follows: The apparatus is rolled out from the shore to the greatest depth at which it is desired to work, the end at which is the sand-elevator 9 being on the sea side, so that the sand therefrom will be dumped always in the rear of the machine. The caisson is dropped onto the bottom and the water expelled by air-pressure. The operator enters through the air-lock and shovels the sand out below the edge of the caisson at the point where the elevator 9 can take it up. The elevator is worked continuously from overhead and the clearing of the top layer of dirt proceeds from within the caisson under the observation and perfect control of the operator. When the stratum of gold-bearing sand is reached, the elevator 9 is stopped and the suction-pump 7 is started. The operator below feeds the sand to the suction mouthpiece of the pump. The mouthpiece may be fixed and the sand shoveled thereto or the mouthpiece may be attached to the end of a flexible hose, so that it can be moved over the ground freely to suck up the sand at different points. Sufficient water is permitted to enter the caisson to act as a carrier for the sand from the suction-pump and to serve in the sluicing of it afterward. The suction-pump discharges, as stated, directly into the sluice-boxes where the gold is separated. When the area of the caisson has been gone over completely, the suction-pump is stopped and the operator

comes out of the caisson. The air-pressure is maintained, so as to lighten the apparatus. The caisson is then lifted above the level of the ground and with the supporting-framework is drawn shoreward a distance equal to substantially the length of the caisson. The previous operations are then repeated until the entire distance between the first point of operation and the dry beach is covered. By working in this way the caisson is always moving toward safety. Furthermore, by the arrangements previously described the operation may be very quickly interrupted and the caisson run up on dry shore to avoid danger by storms. The construction is as strong as possible and the working parts well elevated, so as to avoid danger by ordinarily rough water.

The winches *r r'*, *j j'*, *y y'*, &c., are preferably of the type known as "nigger-heads," upon which the connecting-cable runs slack with several turns around each winch, so that the operator at any time by pulling the cable taut can cause a transmission of power from one to the other. The several mechanisms and operations are such as to require attention in succession and not simultaneously, and therefore to permit of control by a single operator on the platform. For example, the operator will first set in operation the traction-shaft *w* to transport the apparatus to the desired position. He will then release this shaft and set in operation the shaft *q* in a direction to lower the caisson step by step, turning the crank 11 to operate the sand-elevator between each two successive downward movements of the caisson. After the operation of the sand-elevator has stopped it is necessary to set in operation the suction-pump. The air-pump operates continuously. Suitable signals or means for communication between the operator in the caisson and the operator on the platform may be provided; but these form no part of my invention and are well understood, and it is not thought necessary to complicate the illustration by including them.

Though I have described with great particularity of detail a certain specific apparatus embodying the invention, yet it is not to be understood therefrom that the invention is limited to the specific embodiment disclosed. Various modifications thereof in detail and in the arrangement and combination of the parts may be made by those skilled in the art without departure from the invention.

What I claim is—

1. In combination, a support arranged to rest on the bottom, and a caisson supported thereby and adapted to extend to the bottom to permit expulsion of the water therefrom within the area of the caisson.

2. In combination, a support arranged to rest on the bottom, and a caisson supported thereby and vertically movable relatively thereto and adapted to extend to the bottom to permit expulsion of the water therefrom within the area of the caisson.

3. In combination, a support arranged to rest on the bottom, a caisson supported thereby and vertically movable relatively thereto, and guides for said caisson carried by said support.

4. In combination, a support arranged to rest on the bottom, a caisson supported thereby, and a cable attached to said caisson and passing downward to a lower point of said support whereby the caisson may be pulled down.

5. In combination, a support arranged to rest on the bottom, a caisson supported thereby and adapted to extend to the bottom to permit expulsion of the water therefrom within the area of the caisson, and means for moving said support along on the bottom.

6. A caisson provided with means for moving it along while supported on the bottom and adapted to extend to the bottom to permit expulsion of the water therefrom within the area of the caisson.

7. In combination, a support arranged to rest on the bottom, a caisson supported thereby, and a tank carried by said support and adapted to be filled or emptied to be used as a weight or as a float.

8. In combination, a support arranged to rest on the bottom, a caisson supported thereby, and a tank carried by said support and adapted to be adjusted vertically on said support.

9. In combination, a support arranged to rest on the bottom, a caisson supported thereby, and a platform at the top of said support so as to be ordinarily out of reach of waves.

10. In combination, a support arranged to rest on the bottom, a caisson supported thereby, and a sand-elevator passing outside of the caisson to a point approximately level with the lower edge of the caisson.

11. In combination, a caisson and a sand-elevator attached to the outside of said caisson so as to be lowered therewith and having its lower end approximately level with the lower edge of the caisson.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

EDGAR F. SCHEIBE.

Witnesses:
DOMINGO A. USINA,
THEODORE T. SNELL.