No. 864,481. PATENTED AUG. 27, 1907.

D. NEALE.

WING DAM OR DIKE CONSTRUCTION FOR RIPRAP.

APPLICATION FILED FEB. 1, 1907.

4 SHEETS—SHEET 1.

Fig. 1.

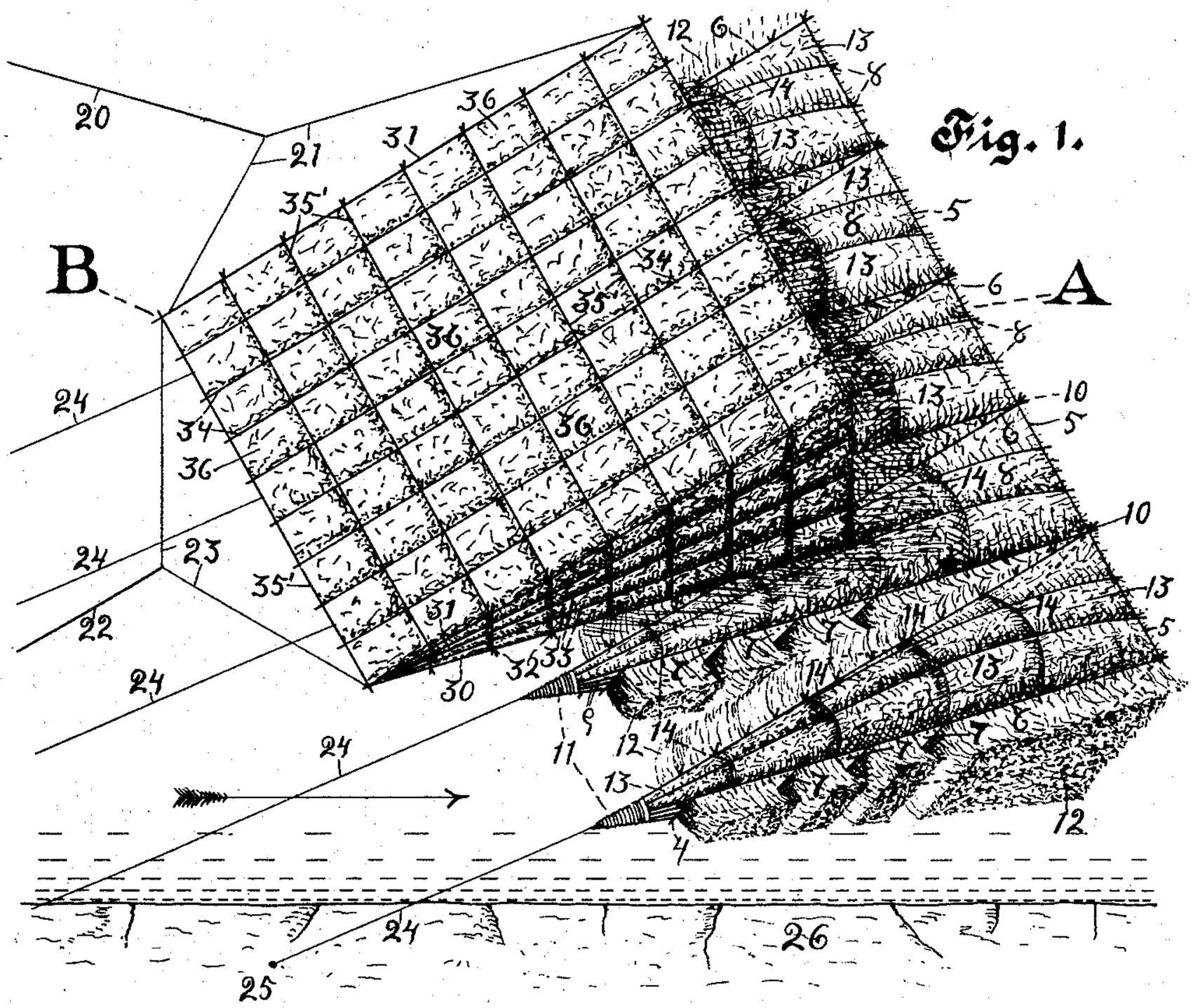
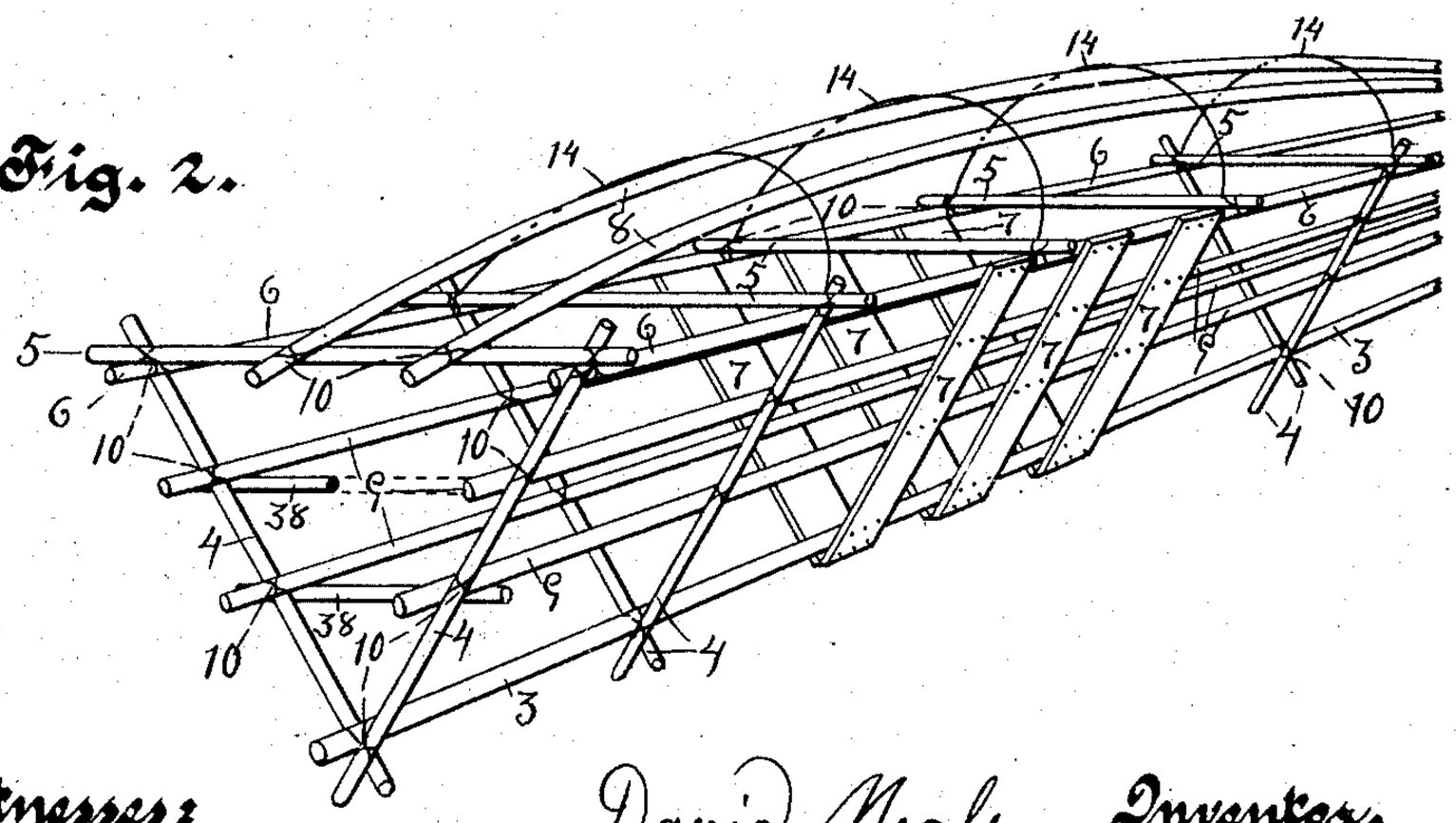


Fig. 2.



Witnesses:
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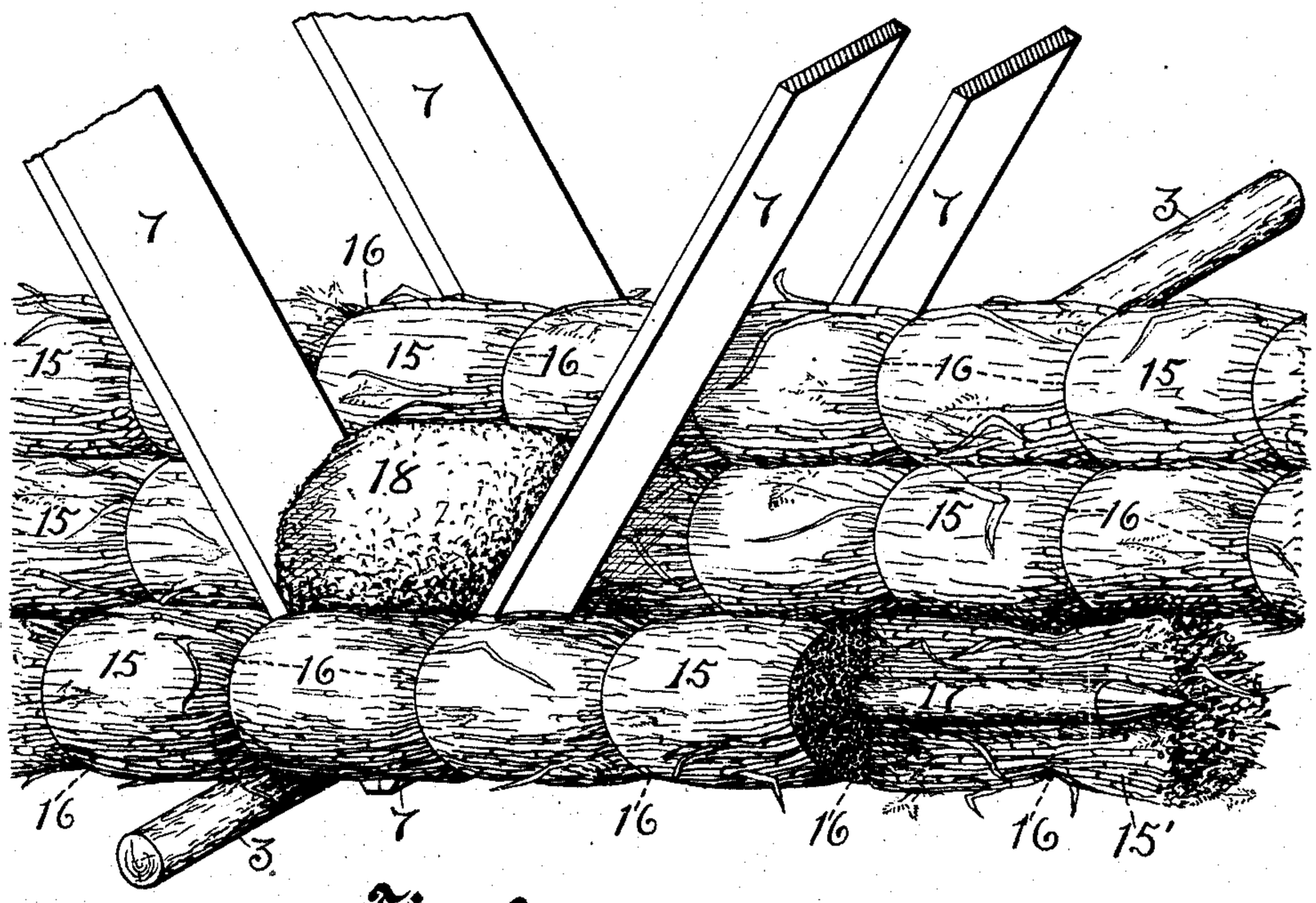

Fig. 3.

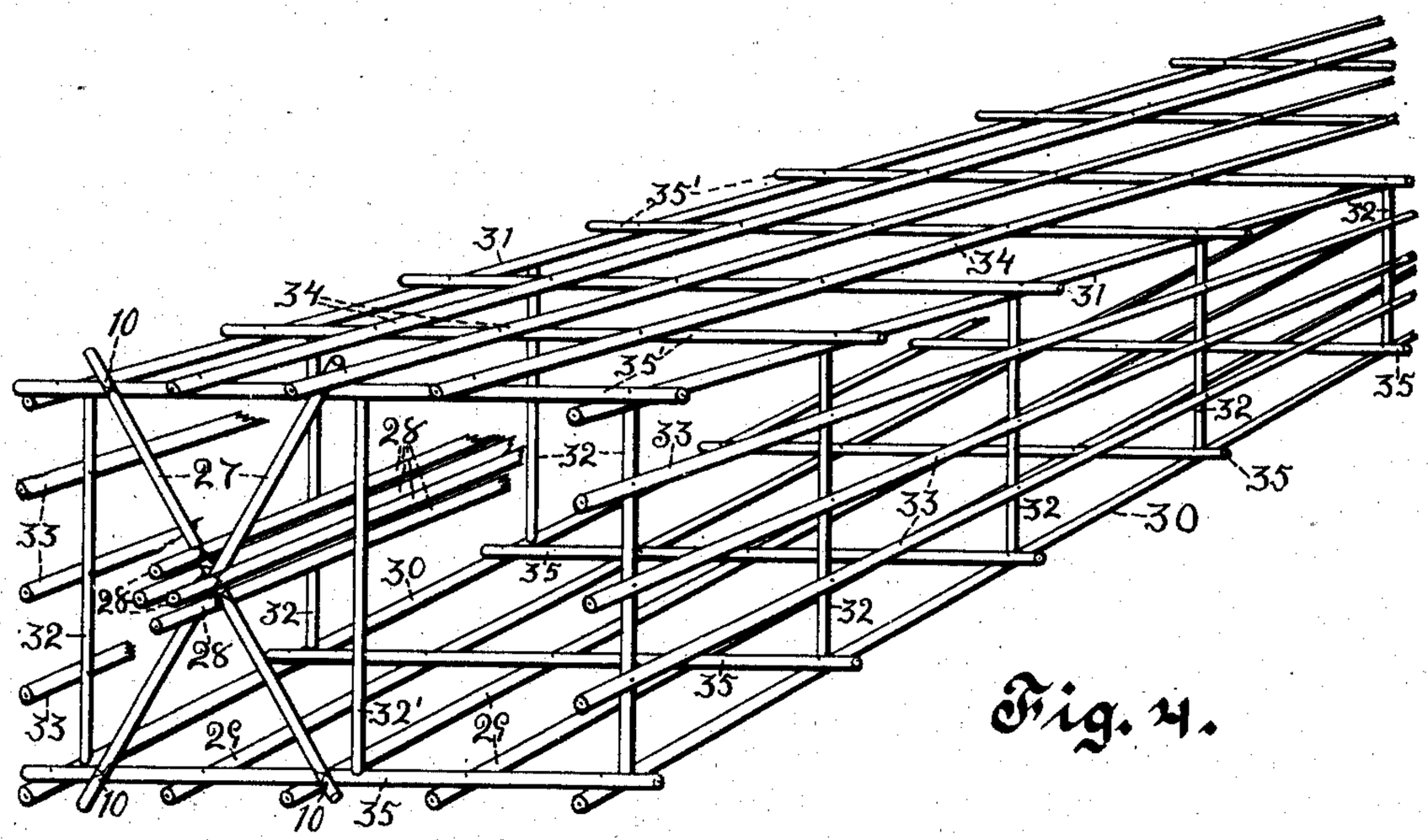

Fig. 4.

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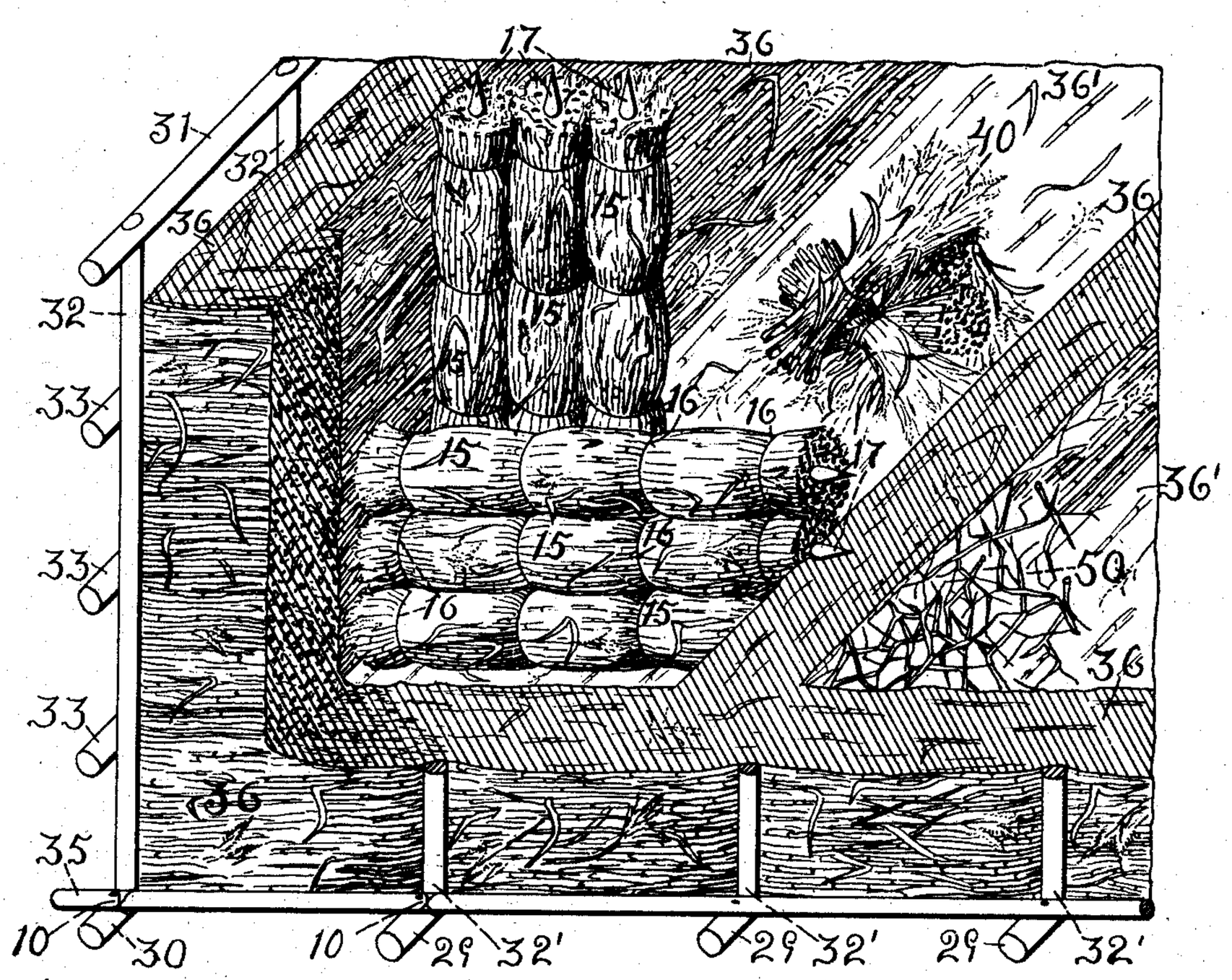

Fig. 5.

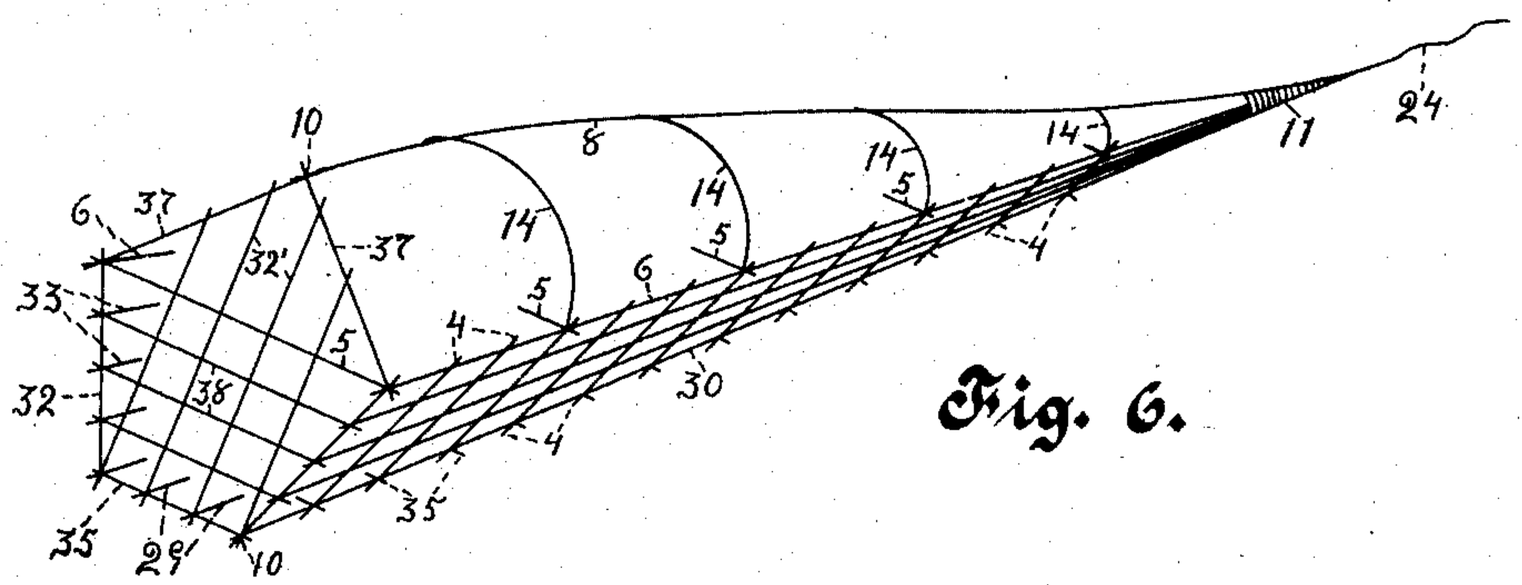

Fig. 6.

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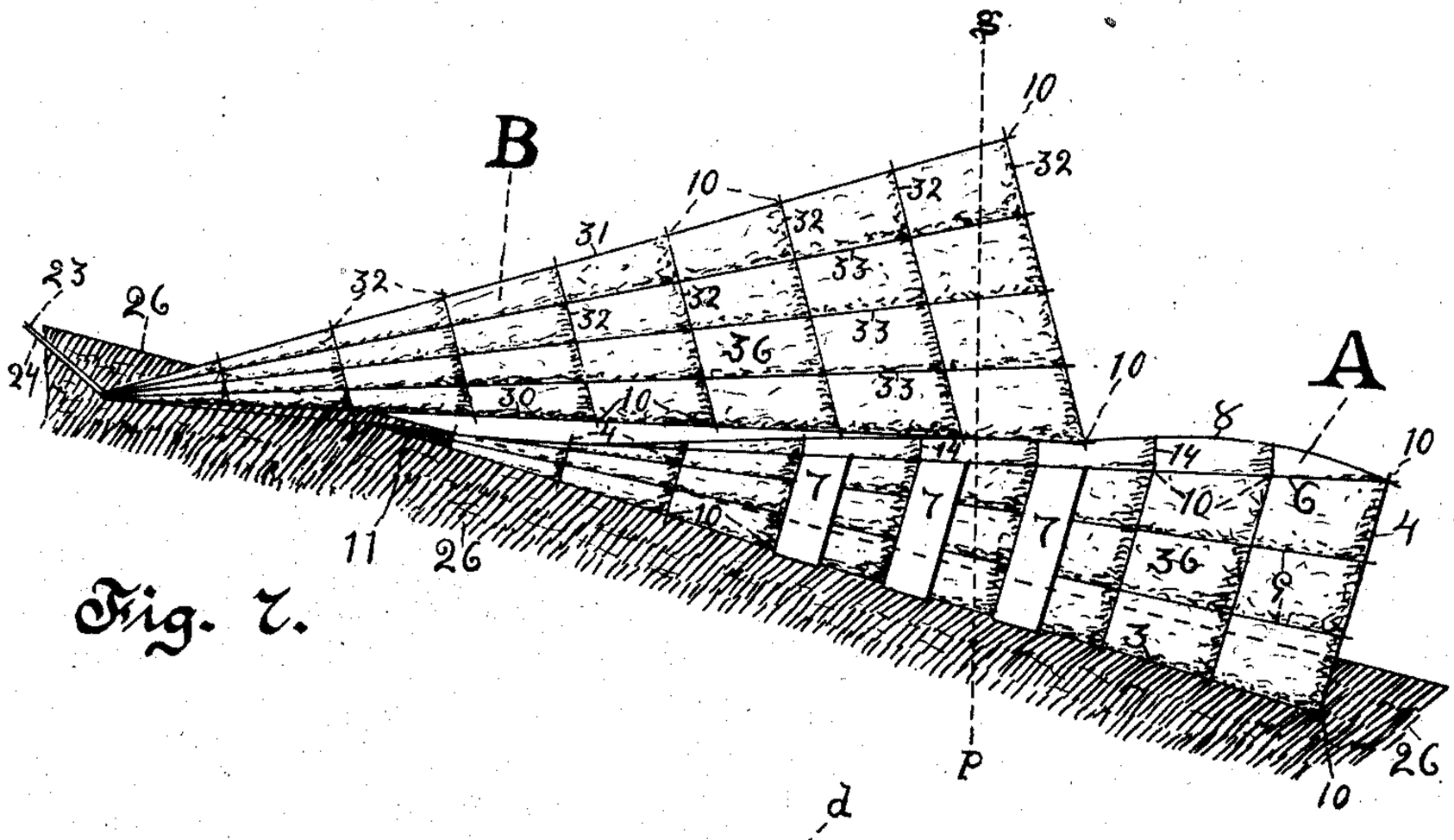

Fig. 7.

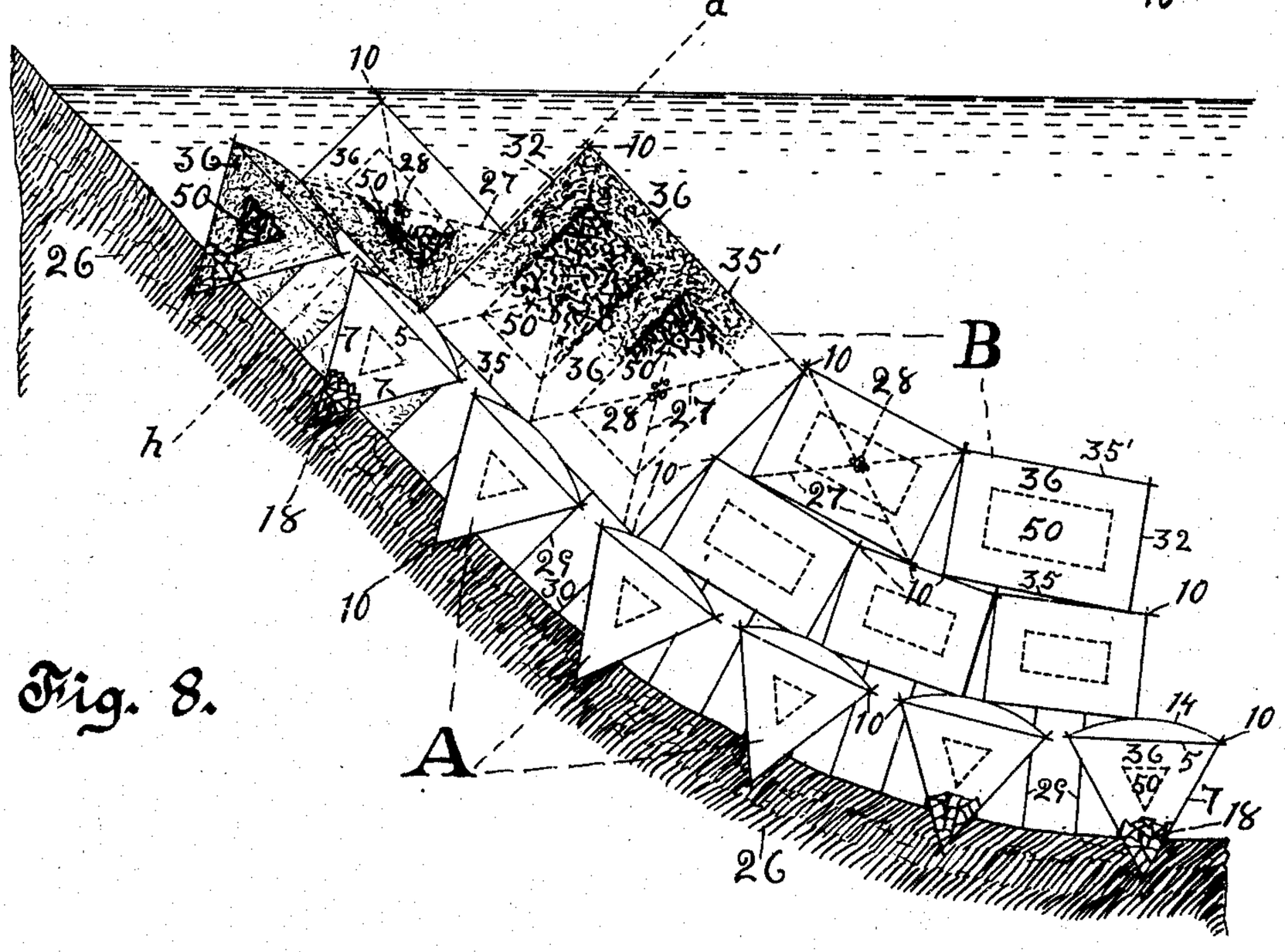

Fig. 8.

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UNITED STATES PATENT OFFICE.

DAVID NEALE, OF NEAR FORT CALHOUN, NEBRASKA.

WING-DAM OR DIKE CONSTRUCTION FOR RIPRAP.

No. 864,481. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed February 1, 1907. Serial No. 355,299.

To all whom it may concern:

Be it known that I, DAVID NEALE, a citizen of the United States of America, residing near Fort Calhoun, in the county of Washington and State of Nebraska, have invented a new and useful Wing-Dam or Dike Construction for Riprap, of which the following is a specification.

My invention particularly relates to the construction of wing-dams or dikes for controlling and protecting the banks of erosive streams. As such erosive streams are straightened and brought under control the adjoining land is drained and utilized for cultivation and pasturage. This limits the area of wild land which before produced large quantities of willows and other brush so much used in riprapping, until the supply of such brush is entirely inadequate to meet the demand. At the same time there is an increase of waste cornstalks and cotton-stalks from the cultivated fields and those large weeds that stock will not eat from the pastures. By this invention I have sought to contrive ways and means whereby the increasing supply of scraggy fibrous cornstalks and cotton-stalks, as well as weeds, reeds, and even bagasse although it is more fluffy soft and tender, may be substituted for the willow brush and serve quite as good a purpose.

There are other minor objects more fully hereinafter set forth.

I attain these objects by the mechanism illustrated in the accompanying drawings in which—

Figure 1 is a perspective view showing a nearly completed submerged wing-dike off the bank of a stream; Fig. 2 is a perspective view showing a preferred construction of frame-work for the substructure or lower fascines at A in Fig. 1; Fig. 3 is an enlarged scale detail in perspective illustrating the construction of bagasse or cornstalk bundles for filling and the manner of filling and weighting the fascines shown in Figs. 1 and 2; Fig. 4 is a perspective view disclosing a preferred construction for fascines of square cross-section or the finishing mattress B of the dike shown in Fig. 1; Fig. 5 illustrates by perspective the method of and means for filling the frame-work or cages of Figs. 3 and 4; Fig. 6 is a miniature perspective of a fascine partaking of the construction and forms of both A and B, a modification for purposes hereinafter more fully set forth. Fig. 7 is a sectional view on the broken line *h d* of Fig. 8, and parallel with the anchor cables 24 of Fig. 1; and Fig. 8 is a cross-section on the broken line *p g* of Fig. 7 and parallel with the base of the wedge-shaped mattress B as shown in Fig. 1.

Similar numerals refer to similar parts throughout the several views.

One of the principal elements used to attain my object is an outer-work or cage constructed of poles or timbers fastened together to protect and retain an outer closely compacted wall 36 of cornstalks, cotton-stalks, weeds or bound bundles of like fibrous materials. As poles are nearly always attainable and serve well the purpose, as well as furnishing a limited supply of brush, always in demand, I have chosen to set forth this feature of my invention by a frame or cage constructed of poles.

The fascines A, which form the bottom or foundation of the dike, are preferably made pointed and about equilaterally triangular in cross-section, as shown in Figs. 1 2 and 8. This pointed and triangular form facilitates holding them against rapid currents while sinking and placing them and the lower sharp angle cuts down to a firm hold in the bank or bottom of the stream see Figs. 7 and 8. This frame is retained in the upright position shown in Fig. 2 during construction and while being filled by a supporting form that assists in placing the different members, but is not shown here. A large straight pole 3 is selected for the bottom or base and the lower ends of the inclined uprights 4 are crossed beneath this pole and the whole fastened together, by wiring, spiking, bolting or by all these means in cases where great strength is required. The top cross-poles 5 and top side-poles or angle-poles 6 are fastened in a like manner to the tops of the inclined uprights forming the upper angles of the fascine at each side of its level top. The intermediate side-poles 9 are placed inside of the inclined uprights and fastened thereto, also the cross-end-poles 38 at the large end of the fascine. The inclosed space is then filled as hereinafter described and then finished on top by piling on a supply of the loose fibrous materials above the cross-poles. Binding-boles 8 are then applied their butts fastened at the large end of the fascine and then sprung over as shown having their top ends with the top ends of the other longitudinal poles 9, 6 and 3, all bound together to form the point 11 as shown in Figs. 1 6 and 7. To further secure this top the cross-binding wires 14 are drawn over and their ends made fast to the top angles. A similar cage of poles—only that it is rectangular in cross-section—is used for the top or finishing part B of the dike. These may be made in fascines of about equal width and height as shown in Fig. 8 or in a large mattress, as shown in Fig. 1, any of which may be pointed or wedge-shaped or simply tapering but not pointed, according to convenience or the requirements. This construction is illustrated in Figs. 1, 4 5 and 8, in which:—The longitudinal lower angle-poles 30 with the intervening longitudinal bottom-poles 29 are disposed and fastened beneath the

bottom cross-poles 35.—See Fig. 4. Here the side uprights 32 have their ends tenoned and wedged into holes bored in the lower angle-poles 30 and top angle-poles 31; but these might be joined and fastened together like the uprights and horizontals of Fig. 2. The intermediate side-poles 33 are fastened on the outside of the uprights so that they serve as fenders to ward off drift and floating ice as well as retain the fibrous wall. Top cross-poles 35′ have their ends fastened on top of the top angle-poles. The intermediate longitudinal top-poles 34 are fastened on top of the top cross-poles where they also serve as fenders as well as to retain the top covering of fibrous materials. Intermediate end-uprights 32′ are disposed and fastened between the end top and bottom cross-poles in a manner similar to the side uprights; and intermediate horizontal end-poles 38 as shown in Figs. 2 and 6 are fastened to the end uprights making an end similar to the sides. The cross-poles 5, 35 and 35′ and the uprights or cross-side-poles 7, 4 and 32, arranged in bents or sets of four in the rectangular cage B, or sets of three in the triangular cage A, their meeting ends fastened together as indicated at 10 serve as a series of encompassing lateral binders to support and retain the longitudinal members of the structure of each cage. And it is obvious that the number of intermediate longitudinal-poles, intermediate cross-poles or binding-poles may be varied from one of either for the smallest fascine to any required number for a large fascine or mattress. To facilitate filling these frames and to support the walls of fibrous materials I have contrived the bundle 15, which is made of any loose fibrous materials as bagasse, weeds, or of cornstalks as represented in Fig. 3. A portion of the stalks at 15′ are shown cut away to reveal the central core-pole 17 around which the loose stalks are evenly assembled, and bound often in the length of the bundle by the encircling wire binders 16; this produces a bulky stiff bundle.

In filling, the cage floor 36′ is first laid of loose cornstalks thoroughly compacted to the desired thickness on top of the bottom-poles; then the outer walls, and partition walls if the materials and work in hand require them, are built up of the cornstalks, of a thickness according to the size of the fascine or mattress. These fibrous walls are closely compacted against the shielding cage of poles and the inclosed space is filled as follows:—If the work is small and fascines proportionally small, the central filling may be of the same materials as the walls, thrown in as loosely and irregularly as possible in order to form the maximum of voids to catch and retain mud or sand. 50 in Fig. 5 and 8 represents cotton stalks which make an excellent filling as they are more scraggy, stiff, strong and crooked. Bound bundles of cornstalks, just as they are cut and bound by machine from the field, thrown in irregularly as shown at 40 in Fig. 5, serve the purpose well and may be used laid up in broken joints for the outside walls. Any of the above mentioned scraggy fibrous materials may be mixed or intermingled with any other rough or irregular shaped rubbish, such as refuse boxes, barrels, crates, scraggy brush or tree-tops, anything that will increase the central voids. Also finer fibrous materials as hay or straw may be used in a similar manner for a general filling. But for work of greater magnitude the bulky stiffened bundles 15 having the ends of the central pole 17 pointed as shown to engage the adjoining walls or partitions, may be arranged in layers transverse to each other, as shown in Fig. 5, to form partitions or sub-partitions between quantities of loose filling materials; or they may by a continued similar arrangement fill the entire space inclosed by the compacted fibrous walls. After which the closing top layer of compacted fibrous materials is placed and the top or binding-poles 34, 35′ or 8 are placed and fastened.

In placing the fascines A it is generally necessary to weight them at the lower angle in order to retain and place them in an upright position resting on the angle at the base-pole 3. For this purpose planks 7 are substituted for part of the inclined uprights 4,—as shown in Figs. 1, 2 3 7 and 8. These planks are spaced a distance apart agreeing on opposite sides and spiked or bolted to the angle and side poles. The filling, which may be loose fibrous materials as 12 in Fig. 1 or 36 in Figs. 7 and 8—where the ends of the stalks are shown projecting through beyond the bars of the cage—or bundles as shown in Fig. 3, is disposed across the lower angle or base-pole 3 and against the edges of the planks forming a cell between opposite filling and opposite planks to receive the weighting material 18 of earth, sand, rocks or anything suitable and convenient. Above the weighting, which is carried to a height sufficient to attain a load that will ballast the fascine, or to sink it,—which is sometimes necessary,—the cell is filled with the fibrous or bundle filling being used.

In large fascines or mattresses or where there is a scarcity of stiff, scraggy, or coarse materials for central filling and to centrally support the bundle partitions, I arrange the longitudinal core-poles 28 supported in their length as often as necessary by pairs of inclined cross-poles or brace-poles 27, as shown in Fig. 4 and indicated by broken lines in Fig. 8. The four core-poles fastened in the four angles at the crossing of the brace-poles are thus separated, forming a central row of mud-cells, thereby saving as well as supporting the center filling. This bracing also renders the cage laterally stable.

The fascines A are first floated down and sunk into position at the same time being anchored by the cables 24 running from their points to the piles 25 driven into the bank 26. The mattress B may be constructed above, either on the ice or as a raft and sunk into position; or it may be built on the shore and launched and floated into position, held by the branch cables 23 and the main cable 22 attached to its point or thin edge. Where the current is very strong a tug, launch or anchor pile farther out serves through the cable 20 and branches 21 to swing the mattress out laterally to the desired position where it sinks or is sunk by weighting which may be placed inside during construction or deposited on top as a top facing to the wing dike. This mattress being whole or of sections placed close together closes the upper ends of the longitudinal triangular spaces between the fascines as shown in Fig. 8 and prevents water courses from forming and cutting beneath to undermine the dike when once well settled. The thin upstream edge of the mattress overlaps and

finally settles into the bank above the points of the fascines as shown in Figs. 1 and 7. When placed in the inclined position against the bank, as shown, being wedge-shaped it throws the current out and up from the bank against which it is firmly held by the pressure of said current. The fall of water over the base of the wedge strikes the exposed large ends of the fascines which prevents undermining at the downstream side of the dike; this current is then neutralized by the resulting eddy from the point of the dike, resulting in dead water and consequent accretions.

In many instances where the stalks or weeds are on adjoining fields within hauling distance, by teams, of where the dike is built, the cage is taken on a special broad gage wagon lengthened out and drawn through the field and filled directly from the raked windrows of scraggy fibrous materials; a loader placing the finer stuff around the outsides and tramping it firmly while filling the center with the coarser material thrown in loosely and irregularly. The form of fascine illustrated in Fig. 6 has a broad base on which it stands firmly on the wagon while being loaded, without using the supplemental supporting frame required to carry the triangular cage; and where currents are slow and the bed of the stream soft it is quite as efficient in the stream and does not settle down so far. In this modification a pair of end cross-poles 37 and 37 are elevated at the center where the central binding-pole 8 is fastened; this facilitates increasing the size of the large end of the fascine, which is very often desirable.

I claim:

1. A fascine having a core of unarranged scraggy fibrous material within a shell of compacted fibrous material protected by a surrounding cage.

2. A fascine having a core of unarranged bundles of fibrous materials within the walls of compacted fibrous materials confined by a surrounding cage.

3. A fascine or mattress for riprap consisting of, a cage, a wall of scraggy fibrous materials compacted against the inside of the cage walls, and a core of loose scraggy fibrous materials.

4. A fascine or mattress for riprap consisting of an outer wall of finer fibrous materials within a protecting cage and having a central filling of coarser materials.

5. A cage to confine fibrous filling in fascines, consisting of longitudinal poles, and cross-poles fastened end to end around to form encompassing lateral binders to support said longitudinal poles.

6. A mattress for riprap having, an exterior retaining cage, outer walls of compacted fibrous materials within the cage, cross partitions of reinforced fibrous bundles and the resulting cells filled with unarranged loose scraggy fibrous materials.

7. A mattress for riprap consisting of, an exterior cage, inclosing walls of compacted fibrous material within said cage, reinforced bundles of fibrous materials arranged transversely in adjacent tiers to form a partition to support said inclosing walls, and an internal filling of unarranged bundles of fibrous materials.

8. A mattress for riprap consisting of, an exterior cage; outer walls of compacted fibrous materials within said cage; partitions composed of bound bundles of fibrous materials, reinforced by axial poles with pointed ends to engage said walls; and the divided inclosure filled with unarranged scraggy or fibrous materials.

9. A bundle of pliant fibrous material compacted and bound around an axial pole to stiffen the bundle.

10. A reinforced bundle for partitions in riprap-mattresses consisting of, pliant fibrous material compacted and closely bound around an axial pole having pointed ends.

11. A wing-dike for stream riprap consisting of, a tier of pointed fascines anchored upstream from their points and disposed parallel with each other down the bank, and overlaid by a wedge-shaped mattress anchored upstream from its point.

12. A wing-dike for stream riprap consisting of, a substructure of triangular fascines set on their angles parallel with each other in a tier up and down the bank, and a superstructure of mattress lapping over onto the bank beyond the upstream ends of said fascines.

13. A wing-dike for stream riprap consisting of, pointed fascines of triangular cross-section ranged parallel with each other in a tier up and down the bank each set on one of its angles with its point upstream, and a superimposed wedge-shaped mattress its point lapped against the bank upstream beyond the points of the fascines and the large ends of the fascines projected beyond the base of the wedge-shaped mattress.

14. A fascine consisting of, longitudinal angle-poles, encompassing cross-poles fastened together at their ends and to said angle-poles, intermediate longitudinal side-poles fastened to said cross-poles, and the interior filling of scraggy fibrous materials.

15. A fascine consisting of, a longitudinal base-pole, outwardly inclined uprights fastened at their lower ends to said base-pole, longitudinal angle-poles fastened to the top ends of said uprights, cross-poles fastened at their ends to the top ends of said uprights and to said angle-poles, side-poles fastened to said uprights, an interior filling of scraggy fibrous materials, and longitudinal binding-poles bent over the top and having their ends fastened at the ends of the fascine.

16. A fascine consisting of, a cage formed of base, side and angle longitudinal poles fastened to encompassing cross-poles fastened together at their ends, a filling of scraggy fibrous materials in said cage and piled above the top cross-poles, a longitudinal binding-pole bent down over said filling and its ends fastened to the ends of said cage, and a cross-binder of wire drawn over said binding-pole and its opposite ends fastened to opposite sides of said cage.

17. A fascine comprising, a longitudinal base-member, uprights spaced apart and fastened at opposite sides of said base-member, filling material disposed across said base member and through opposite spaces between said uprights, and weighted material deposited in the space inclosed by said uprights and the filling against their edges.

18. A fascine consisting of, a longitudinal base-pole, outwardly inclined uprights fastened to said base-pole, longitudinal angle-poles fastened to the tops o fsaid uprights, cross-poles fastened at their ends to said uprights and angle-poles, longitudinal side-poles fastened to said uprights, a filling of scraggy fibrous material up to and above said cross-poles, a longitudinal binding-pole disposed on top of said filling and having one end fastened and its opposite end with the adjacent ends of the other longitudinal poles all brought together and bound.

19. A fascine consisting of, a filling of scraggy fibrous material confined by a cage composed of longitudinal poles and encompassing binders, said longitudinal poles brought together and bound at one end to form a taper and point to said fascine.

20. A fascine consisting of, a cage composed of longitudinal-poles, cross-poles fastened to said longitudinal-poles, at one end of said cage the ends of said longitudinal-poles brought together and fastened to form a pointed end to the fascine, and a filling of scraggy or fibrous material.

21. A cage to confine fibrous filling in fascines, consisting of, longitudinal-poles, cross-poles fastened to said longitudinal-poles, and the ends of said longitudinal-poles at one end of said cage brought together and bound.

22. A cage to retain fibrous filling and weighting materials for fascines, consisting of, a longitudinal-base-pole, outward-inclined uprights of plank spaced apart and

fastened to opposite sides of said base-pole, longitudinal-angle-poles fastened to the tops of said uprights, and top-cross-poles their ends fastened to said angle-poles.

23. A fascine or mattress consisting of, an exterior retaining-cage, brace-poles crossed through said cage, longitudinal-core-poles disposed and fastened in the angles at the crossing of said braces, and a filling of scraggy fibrous material within said cage.

24. A retaining cage for fiber-filled fascines, consisting of, longitudinal-poles, cross-poles fastened to said longitudinal-poles, brace-poles fastened to cross each other within the cage, and longitudinal-core-poles disposed and fastened in the angles at the crossings of said brace-poles.

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